A

SYSTEM

OF

OPERATIVE SURGERY.

VOL. II.

Strahan and Preston,
Printers-Street, London.

[illegible] Royal. 1827

A

SYSTEM

OF

OPERATIVE SURGERY,

FOUNDED ON

THE BASIS OF ANATOMY.

By CHARLES BELL,

SURGEON OF THE MIDDLESEX HOSPITAL;
FELLOW OF THE ROYAL SOCIETY, AND OF THE ROYAL COLLEGE OF SURGEONS, OF EDINBURGH;
MEMBER OF THE ROYAL COLLEGE OF SURGEONS OF LONDON;
ASSOCIATE OF OTHER LEARNED BODIES;
AND READER OF ANATOMY IN THE CHAIR OF DR. HUNTER.

THE SECOND EDITION.

IN TWO VOLUMES.

VOL. II.

LONDON:

PRINTED FOR LONGMAN, HURST, REES, ORME, AND BROWN,
PATERNOSTER-ROW;
AND CADELL AND DAVIES, STRAND,

1814.

TO

JAMES WILSON, F.R.S.

SUCCESSOR IN THE CHAIR OF DR. HUNTER AND DR. BAILLIE,

IN TESTIMONY OF RESPECT FOR HIS LABOURS,
BY WHICH HE HAS KEPT ALIVE A TASTE FOR THE HIGHER BRANCHES OF ANATOMY,

AND

IN TOKEN OF ESTEEM FOR HIS CHARACTER AS A TEACHER AND ASSOCIATE,

THIS VOLUME IS INSCRIBED,

BY HIS FRIEND, THE

AUTHOR.

CONTENTS

OF

THE SECOND VOLUME.

INTRODUCTION on the derangement of the Constitution consequent of Wounds - - xix

SECTION IX.

Page

Of Amputation, Page 1.

Amputation of the Thigh - - -	7
——— of the Leg below the Knee - -	20
——— of the Leg near the Ancle - -	23
——— of the Metatarsal Bones - -	25
——— of the Metacarpal Bones - -	26
——— of the Toes and Fingers - -	28
——— of Part of the Foot - -	*ib*
——— of the Arm above the Elbow -	29
——— of the Forearm below the Elbow -	*ib.*
——— of the Arm at the Shoulder Joint -	30
General concluding Remarks - -	34
Amputation of the Penis - - -	36

SECTION X.

Operations on the Eye, 41.

Of the Cataract - - - -	42
Of couching or depressing the Cataract - -	46
Of extracting the Cataract - - -	54

Page
Operation for the congenital Cataract - - 70
Anterior Operation - - - 71
Posterior Operation - - - - 72
Of Inflammation of the Eye, and Treatment after Operation - - - - 74
Of Puncturing to evacuate the Aqueous Humour 79
Relaxation of the Eyelids - - - 81
Eversion of the Eyelid - - - ib.
Inversion of the Eyelid - - - 82
Tumours of the Eyelids - - - 84
Operation on the Encanthis - - 87
Operation on the Pterigion - - - 88
Opacity of the Cornea - - - 90
Application of Caustic to the Cornea - - 91
Of the Staphyloma - - - - 92
Protrusion of the Iris - - - 94
Dropsy of the Eye - - - - 96
Of the Artificial Pupil - - - 97
Extirpation of the Eye - - - 99

SECTION XI.

Operations for the Extirpation of Tumours.

Some Hints on the Formation of Tumours - 103
I. Incysted Tumours - - - 117
II. Glandular Tumours - - - 118
III. Varix - - - 121
IV. Excrescentiæ - - - 122
V. The diseased Growth of a vascular Fleshy Substance involving the Parts promiscuously Hypersarcoses - - - - 123
Treatment of Tumours - - - 127
Cancerous Breast - - - 133
Commencement of the Disease - - - 135
Varieties of Cancer in the Breast - - 136
Character of the Disease - - - 137
Lymphatic Glands diseased - - - 139

	Page
Treatment before Operation - -	140
The Operation - - -	141
Cutting out the Glands of the Axilla -	145
Hints on the Operations for the Extirpation of Tumours - - - -	148
Of a Tumour forming in a Nerve - -	158
Of Polypus of the Nose - -	162
Of tying Polypi of the Nose - -	168
Effect of the Growth of Polypi - -	170
Of cutting off the Polypus - -	172
Polypus of the Ear - - -	173
Polypi of the Vagina and Uterus - -	174
Ulcer and Tumour on the Tongue - -	181
Operation on the Amygdalæ - -	183
Of the relaxed Uvula - - -	184

SECTION XII.

Operations for the Discharge of Preternatural Fluids or of Paracentesis.

Ascites - - - -	186
Tapping the Abdomen - -	187
Of Paracentesis Thoracis - -	194
Of Psoas Abscess - - -	197
Of Abscess in the Ear - -	204
Of Abscess in the Frontal and Maxillary Sinus	208
Perforating the Maxillary Sinus - -	210

SECTION XIII.

Operations performed for the Relief of Lameness from Contractions or Ruptures of the Muscles and Tendons, whether owing to Disease of the Muscles, to original Defects, to Inflammations and Adhesions, or finally to Accidents.

Stiffness from a Disease in the Muscle -	213
Wry Neck - - - - -	214

	Page
Rigidity and Contractions of the Limbs -	217
Rupture of Muscles and Tendons -	221

SECTION XIV.

Some Observations on the Surgical Treatment of the Joints.

On the Knee Joint - - -	224
Dropsy of the Knee Joint - -	232
Of Collections in the Bursæ - -	233
Loose Cartilages in the Knee Joint -	235
Disease of the Hip Joint - -	236

SECTION XV.

Of the Disease and Injury of the Spine.

Of the Disease of the Bodies of the Vertebræ	241
Of the Curved Spine - - -	242
Of the Lateral Curvature of the Spine -	250
Of Fracture of the Spine - -	255
Of Dislocation of the Spine - -	259

Of Dislocation.

Divisions of Dislocation into Kinds - -	263
Dislocation of the Clavicle - -	272
Dislocation of the Humerus - -	273
Position of the Head of the Humerus -	277
Reductions in simple Cases - -	278
Accidental Reduction of the Humerus -	280
Dislocation of the Elbow - -	292
Subluxation of the Elbow - -	293
Dislocation of the Radius at the Elbow -	294
——— of the Wrist - -	295
——— of the Bones of the Hand -	296
——— of the Thumb and Fingers -	*ib.*
——— of the lower Jaw - -	300

Page
Dislocation of the Horn of the Os Hyoides - 302
——— of the Cartilage of the Rib from the Sternum - - - 303
Of Dislocation or Diastasis of the Bones of the Pelvis - - - - ib.
——— of the Os Coccygis - 306
——— of the Hip Joint - - 307
Where the Head of the Bone lies on the Back of the Ilium - - - ib.
Manner of Reducing the Thigh Bone when dislocated upwards - - - 309
When dislocated downwards - - 313
Dislocation of the Patella - - 316
Injury of the Inner Lateral Ligament of the Knee Joint - - - - 317
Subluxation of the Knee Joint - - 319
Dislocation of the Ankle Joint - - 320

Of Fractures.

Of the Varieties and general Treatment of Fractures. (By mistake the whole of this chapter has been omitted in its proper place, the reader will find it in the Appendix.)
Of the Means proposed for exciting the Ossific Action, when a Joint has been formed in consequence of the Mismanagement of Fracture 324
Fracture of the Clavicle - - - 329
——— of the Acromion Process of the Scapula 332
——— of the Body of the Scapula - - 334
——— of the Humerus - - - 336
——— of the Olecranon - - - 337
——— of the Radius - - 339
——— of the Bones of the Hand - - 342
——— of the Thigh Bone - - 343

Page
Fracture of the Neck of the Thigh Bone - 351
——— of the Patella - - - 357
Rupture of the Ligament of the Patella - 362
Fracture of the Fibula - - - 363
——— of the Tibia - - - 365
Of the Period of Confinement in Fracture of the Extremities - - - 367
Fracture of the Rib - - - 369
——— of the Sternum - - 375
——— of the Bones of the Pelvis - - 376
——— of the Lower Jaw Bone - - 377
——— of the Bones of the Nose - - 381

SECTION XVI.

Of Hæmorrhage.

On the Ligature of Arteries - - 382
Some Observations on the Stopping of Hæmorrhagies - - - - 385
Hæmorrhagy from the Nostrils - - 389
Of the Sponge - - - - 391
Of the Needle and Tenaculum - - 393
Of the Ligature - - - - 395
Rules for tying Arteries when divided in Wounds, and a Description of the Manner of dissecting for them - - - 399
Classification of the Arteries in the order of their Importance to the Surgeon - - 401
Of Wounded Arteries - - - 402
Case of Diffused Aneurism from Wounded Artery - - - - 416
Secondary Bleeding from Gunshot Wounds - 421
To Cut for the Carotid Artery - - 426
——— for the External Carotid Artery - 427
——— for the Thyroid Arteries - - *ib.*
——— for the Lingual Artery - - 428
——— for the Occipital Artery - 429

To

Page

To Cut for the Subclavian Artery - - 429
——— for the Lower Part of the Axillary Artery - - - - - - 430
——— for the Humeral Artery lower in the Arm 431
——— for the Radial Artery - - *ib.*
——— for the Ulnar Artery - - 432
——— for the Femoral Artery - - 433
——— for the Gluteal Artery - - *ib.*
——— for the Ischiatic Artery - - 434
——— for the Anterior Tibial Artery - *ib.*
——— for the Fibular Artery - - 435
——— for the Posterior Tibial Artery - - 436

SECTION XVII.

Gun-shot Wounds, 437.

Of a Wound by a Musket Ball - - 445
Of the Course of a Bullet, and of the probable Place of Lodgement - - - - 450
Of the Inflammation of Gun-shot Wounds - 458
Treatment of Gun-shot Wounds of Fleshy Parts 460
General Treatment - - - 463
Treatment of Gun-shot Fractures - - 467
Of long continued Sinuous Ulcer, and of Necrosis from Gun-shot Fracture - - - 477
Of Necrosis from Gun-shot Fracture - 480
Of Wounds of the Joints - - - 482
Of the Time for Amputation in Cases of Gun-shot Wounds of the Extremities - - 494

APPENDIX.

Distinctions relative to Fractured Bones - 499
General Treatment of Fracture - - 504
Dislocation of the Thumb - - - 517

EXPLANATION OF THE PLATES

IN

THE SECOND VOLUME.

PLATE I.

Fig. 1. THIS represents the os innominatum and thigh bone destroyed by the hip-disease. There had taken place an absorption of the bottom of the acetabulum, as well as of the head of the thigh bone; so that here the neck of the thigh bone is represented as projecting into the pelvis. Here no anchylosis took place, and the motion of the thigh bone in this unnatural position continued the inflammation so as at last to exhaust the patient by hectic.

A, The os innominatum.

B, The os pubis.

C, The thigh bone.

D, The head, or rather only the neck, of the thigh bone, projecting into the cavity of the pelvis.

Fig. 2. In this figure is represented the caries of the vertebræ, which precedes their yielding to the pressure of the upper part of the trunk, and the confirmed disease described under the term curvature of the spine.

PLATE II.

Fig. 1. The fractured patella, with its ligament.

A, The newly-formed ligament intermediate betwixt the portion of the fractured bone.

B, The

B, The upper portion of the patella, which was broken off, and receded with the quadriceps muscle of the thigh.

C, The lower portion of the patella.

D, The ligament by which the patella is connected with the tibia.

Fig. 2. Another specimen of the fractured patella.

A, The natural ligament of the patella.

B, The lower portion of the fractured bone.

C, The intermediate tendon formed betwixt the fractured portions of the patella.

D, The upper portion of the patella.

In the case from which the first figure was taken, the portions of the patella still lay on the surface of the thigh bone, and playing over the head of that bone in its motion, threw the action of the tendon off from the centre of the joint, increasing consequently the force of the muscle. The nearer the fractured portions of the bone are to each other, the stronger is the union betwixt them. In the second fig. the intermediate portion of new ligament is longer and proportionably weaker, and, in the next plate, the effect of this will be seen.

Plan. Fig. 3.

A, The lower head of the thigh bone.

B, The head of the tibia.

C, The patella fractured.

D, The ligament of the patella, which connects the lower fractured portion of the bone with the tibia.

E, The muscle inserted into the upper portion of the patella.

This plan shews that when the patella is mounted on the convex surface of the articulating head of the thigh bone, the sudden and violent action of the muscles on the thigh may snap it across, without the knee touching the ground.

Plan. Fig. 4.

This plan is designed to shew the similarity in effect of the fracture of the olecranon at the elbow joint with that of the fracture of the patella.

A, The

A, The humerus.

B, The ulna.

C, The olecranon broken off.

D, The cavity into which the point of the olecranon should enter, when the arm is distended in the natural state of the parts.

If the arm be kept bent during the cure, then the space marked by the dotted lines betwixt the olecranon and the ulna will be occupied by callus or new bone, and it will then be impossible to extend the arm; for before the fore arm is extended, the olecranon, C, will strike on the back of the humerus, A. We may easily understand, too, that if the arm be too much extended, the ulna, B, will press the olecranon, C, out of the cavity, D, consequently, after the union, the natural check to the extension of the arm will be lost, and there will be danger of a strain of the elbow-joint, from the insufficiency of the anterior ligament to restrain the motion backward.

Plate III.

This plate represents the fore part of the knee-joint torn open. It is intended to exemplify the consequences of allowing the upper portion of the patella to be drawn up by the action of the quadriceps femoris muscle.

This man had a fractured patella. The new ligament which was formed betwixt the portion of the bone incorporated with the integuments on the fore part of the joint, so far as to destroy their elasticity in a considerable degree. The man carrying a burden, slipt, and fell backward, and the knee bending under him, the ligament, and with it the integuments of the knee-joint burst up, and disclosed the cavity of the joint.

A A, The torn integuments.

B, The articulating surface of the femur exposed. The attempt to unite the integuments failed, and amputation was necessary.

Plate IV.

This represents a section of a diseased nerve, spoken of in the text under the head of Tumours.

A A, The tibial nerve.

B B, The fibular nerve.

C C, The tibial nerve enlarged into a great tumour, which occupied the ham.

D D, The surface exposed by cutting the tumour in two parts.

E, The red granulating matter which occupied cells in the tumour.

Plate V.

This is a slight etching of the knee-joint and popliteal artery. This case is given as an example of the effect of a torn popliteal artery, as distinguished from the common aneurism in this artery.

A, The popliteal artery.

B, The hole torn in the artery.

C, The irregular projection of the shaft of the femur which tore the artery.

D D, The coagulated blood condensed and united to the cellular membrane, so as to make an irregular sac.

E, The capsule and integuments of the joint greatly dilated, in consequence of the aneurismal blood having been driven into the joint.

F, The patella raised from the femur, in consequence of the dilatation of the cavity of the joint.

G, A pencil introduced betwixt the heads of the bones, to shew the communication betwixt the irregular aneurism and the joint.

N. B. The irregular bone which projects at C, is a consequence of a previous fracture of the femur; or rather a kind of diastasis; for, when a lad, the leg was forcibly twisted, and the apophysis of the femur broken off from the shaft of the bone. The patient was of mature years before this aneurism took place, from an exertion of the muscles forcing the artery against the projecting bone.

INTRODUCTION

TO

THE SECOND VOLUME.

BEFORE proceeding further to detail the manner of performing the operations of surgery, I take the opportunity of the commencement of a second volume, to lay some observations before my reader on the prevailing diseases of the system,—a subject which must never be lost sight of, in performing even the most common operation.

OF THE DERANGEMENT OF THE CONSTITUTION CONSEQUENT OF WOUNDS AND SURGICAL OPERATIONS.

I. THERE is an influence ever present in the living body, which philosophy, as well as the suggestions of common sense, forbids us to hope we shall ever fully comprehend. But we may observe it in its effects. We see it governing the growth and shape; and limiting the magnitude of all the parts of the body, and have reason to hold it a part of the constitution of the living frame, that this influence shall be in perpetual operation.

II. This, however, is a conclusion which we arrive at slowly, as the result of long continued ob-

observation. When the doctrines of the absorption of the body, with all their series of beautiful proofs, establish this singular fact: — that no part of the body, solids or fluids, is for a moment stationary; — that they are undergoing incessant revolutions of decay and renovation; — that while the *matter* is changing, the *disposition* and the *constitutional peculiarities*, and all that identifies the individual, remains the same! then we are convinced, that a certain influence uniformly prevails, directing all the operations of the system.

III. When we see injured parts restoring themselves, or the edges of recent wounds re-uniting, we recognise the influence of this endowment of living matter to sustain itself; and we call it a natural and healthy action. The common opinion, on the authority of Mr. Hunter, is, that to restore a part which has been injured, requires "a new "mode of action:" on the contrary, I consider this incessant activity at all times prevailing in the body, and changing the component particles, to be a provision against the accidents to which we are exposed; a provision for restoring the frame when broken or injured, and this, not by the excitement of a new action, but by the continuance of that action, which at all times subsists, governing the restoration of the frame. I hold, that it does not make any difference whether the parts have been changed by the usual process of absorption, or by the violence of the injury, in either case the action of restoration is the same.

IV. Besides

IV. Besides the greater simplicity of this view of a living body, it enables us to avoid the use of terms which, in my opinion, are highly exceptionable. It is easier to conceive one uniform prevailing influence, resembling that which is inherent in all matter and which governs every change, than to imagine the several parts of the body to be endowed with a consciousness of imperfection; or to be impressed with a necessity; or endowed with a sense of injury, or a disposition arising from necessity, which is the language of Mr. Hunter. If the violence done to the body be not greater than the powers of life can sustain, and if the system be in health; the continuance of the natural action closes and heals the wound, or fills up the vacuity to the natural level. The surgeon has here nothing to do, but by position mechanically to relax the parts which are in tension, or to support them; to be, in short, the very humble minister of Nature.

V. If the injury committed on the body, be greater than the natural powers can bear; or if a feeble state, approaching to disease, prevails at the time the injury is inflicted, then the surgeon's duty is not confined to manual operation; he must undertake the *medical* treatment of the patient.

VI. The temperature, and the degree of moisture of the atmosphere in which we are immersed, — the hidden qualities of the air we breathe, (qualities which it is not given to the senses to distinguish,) — the food we take, and the circumstances of place not yet fully understood,

silently influence the constitution; so that long before the disorder is made manifest by symptoms, the natural powers are disturbed and weakened.

VII. In this state of the body, if wounds be accidentally received, or an operation performed, the aspect of the sore will quickly display the prevailing disease, which till this time had escaped observation. I would impress it on the young surgeon, as a duty of the first importance, that he study thoroughly this state of the constitution. He will in practice find it of the greatest use to him: it will save him from the commission of errors, which ought to leave behind them something worse than regret. Before the surgeon performs a formidable operation, or interferes even slightly with any delicate organ, he ought carefully to study his patient's constitution. His countenance, his eye, his tongue, his appetite, and the colour of his discharges ought to be examined; and perhaps by removing the disorder of the system generally, the necessity of the meditated operation may be avoided. A man has a tumour which is to be extirpated; he in the mean time walks about, and sees his friends, and has no disease visible to the unexperienced eye; but when the operation is performed, then the prevailing temper of his system shews itself; the lips of the wound do not swell and inflame, as a part in health and so injured ought to inflame; they remain flaccid; by and bye a gleety discharge is poured out, and the fascia is bare as if dissected: then the parts slough, and the patient sinks.

 VIII. In

VIII. In defining ulcer, we say that it proceeds from a vice of the constitution, from an internal cause. But there is still a difficulty; for when does the purulent wound become an ulcer? It is not in imitation of the authors who have filled their pages with distinctions, that I state this question; but that in the very first outset, I may draw my reader to observe that change upon a wound (whether inflicted by accident or the surgeon's knife) which constitutes it a part of the general disorder of the system.

IX. There is yet another circumstance deserving attention. A wound apparently slight will injure the constitution. When a smart blow on the head wounds the scalp, the wound becomes irritable, then rigors and sickness follow, and these usher in an erysipelatous inflammation, which spreads over the head and face and neck, producing a frightful swelling. Here we are apt to imagine, that there is something in the nature of the wound which precedes this extensive inflammation. But the truth is, that the wound is operating on the constitution, and the constitution reciprocally on the wound; and this inflammation is therefore constitutional. Thus we see the necessity of re-instating the constitutional powers; while we must not forget, that the wound was at the first of a nature to give activity to this prevailing disposition in the body; that it still operates, and that by every means in our power this source of irritation is to be allayed.

X. The surgeon is often called in to witness symptoms which are distinguishable to every eye, but the causes of which lie deep in the constitution; ulcers on the tongue,—inflammation in the throat, —films and opacities in the eyes,—scabs and eruptions on the skin,—swelling on the joints or bones—I must beg my reader to observe, how these symptoms arise, and with how many other symptoms of bad health they are combined. If he finds his patient indolently reclining, taciturn, moody, and abstracted; if on leading him into conversation there is a wild irregular force of expression; if he complains of pain where there is no actual tenderness on pressure; if the epigastrium is tender, the tongue foul, and the bowels irregular; there is more *general* disease than *local* mischief. It is not, however, this aggravated state of indisposition, but the approach to it that I wish to recommend to my reader's attention.

XI. When the department of surgery was more under the controul of the physician than it is at present, the state of the system was carefully watched before performing the great operations; of late, this has been a good deal overlooked. The profession is much indebted to Mr. Abernethy, for the attention he has paid to the medical treatment of surgical patients, and for the many important facts which his sagacity has discovered in the secret but extensive influence of the bowels on the diseases which are called local.

When I first studied, our attention was very particularly called to the state of the atmosphere

in

in which the patient was immersed; this, I still continue to think a subject of more importance, than even the state of the bowels. And indeed, I think, a misapprehension is entertained among many of our pupils, both in regard to the derangement of the bowels, the effect of atmosphere on surgical complaints, and the connection of exercise with health.

From confinement, and the confined air which surrounds the patient, who has suffered a formidable operation, there is a source of fever which is to be carefully avoided. I know it from the best authority, that those who have suffered amputation after a battle at sea, and have been laid in their births, exhibit a very different appearance according to the place they lie in; those whose situations are most exposed recover; while those lying under the level of the port holes, and where the air does not circulate freely are attacked with fever, and then the wounds open, and a sloughy state soon commences.

XII. In addition to the facts stated in § X. we must be aware, that a very severe injury, or the injury of a part important in the animal economy, will have a sudden and formidable effect; vomiting, restlessness, and anxiety usher in fever, and relief is only obtained by the intestines becoming active, and discharging largely black and fœtid stools. In such state of disorder of the vital powers, it is of most material consequence to procure stools; but while the danger lasts, the intestines are too often obstinate. This

is

is not a singular instance of the resistance to the power of medicine; it holds in fever, for while the action is high, medicines will not effect their usual operation on the bowels. The constitution suffering a violent change, will not yield to the effect of medicines. The action must be lowered, it must remit before the medicines will operate. Thus in tropical diseases, mercury will be resisted in its effect by the violence of the inflammatory action.

XIII. When injury to a vital part is attended with this disorder, and is followed by unnatural stools; we cannot believe, that the state of the bowels is the cause of the disorder: on the contrary, there is strong evidence of the intestinal canal suffering in this instance as in many others, in consequence of the general disturbance. Undoubtedly, however, this diseased secretion into the bowels will prove a cause of aggravation of symptoms; so will the natural contents of the bowels prove an occasion of irritation; when by some accident, as a fractured limb, a man in full vigour and health is laid upon his back, the bowels must be emptied, for the same reason in this case that we procure evacuation in the accession of fever, that there may be no additional source of irritation to the exhausted frame. On this subject, there is an obscurity from inattention to this distinction. 1. That a disease coming to its crisis, will be relieved by large and fœtid discharge from the bowels. 2. The natural contents of the intestinal canal, will become a source of irritation,

when

when the health and strength of the body is diminished, either by disease, or merely by confinement. There are many who conceive that this spontaneous discharge of matter from the intestines, is merely freeing them from an oppressive load, which has been the cause of the mischief. This is a mistaken view. The disease terminates by a secretion from the intestines and liver; and the secreted matter is quickly evacuated. This is the reason of the defective proof, on dissection, of such disorders of the bowels. We do not find the intestines of the dead body loaded in such a manner as the large discharges from the patient's bowels would lead us to expect.

The practice resulting from this view, is that mere evacuation of the intestines will seldom be sufficient to remove a formidable disease of the system. It may remove an occasional irritation. But if I may use the expression, the natural excitement of the bowels must be renewed, before that balance of actions is restored, on which the health depends; before the intestinal canal and liver resume their natural function; nay more, the mere evacuation of the intestines will often leave a torpor not favourable to the recovery of the activity of the abdominal viscera. If in this case we open the bowels, the patient will be relieved. But if we remove him into a free and pure atmosphere, there will be a more favourable and permanent change. The evil is that we are apt to do only one thing at a time, whereas all the means ought to be combined; so here we must both evacuate the

bowels

bowels and remove the patient quickly from the offensive chamber. Impure air is the great source of disease, of the more formidable and fatal diseases, and also of those lesser derangements of the constitutional powers, which shew themselves in the unhealthiness of wounds. The derangement of the bowels is but the precursor to other local complaints; it is but a symptom that something is wrong; there is disease before there is accumulation: though certainly the presence of matter is a new source of diseased action; yet, in very few instances, will the removal of the offensive load be any thing more than the removal of an aggravating circumstance of the *disease*.

XIV. If the state of the bowels have such a remarkable effect, in producing inflammations, and ulcers, and tumours, as they are proved to have, will not common sense, as well as the experience of ages, dictate to us the necessity of such a course of medicine, as will secure a healthy discharge of bile, and consequently a free and natural state of the bowels, before an operation is performed. And surely after an operation, we ought to foresee, that confinement brings on such an accumulation of matter in the bowels, and such a torpor of the abdominal viscera, that the patient languishes and becomes weak and irritable, and then the healthy granulations become pale, and the cure is arrested.

XV. This book is to be in the hands of such as have to seek their fortunes remote from the capital, or in foreign stations, and whose business is not

not to watch the approach of disease from the indolent habits of the citizen; I ought therefore to hint at the laws of the constitution, as modified by climate.

A person receives a wound, slight perhaps in appearance; it does not inflame materially; misery is in his look; he is attacked with stiffness and spasms about the jaws; the epigastrium is next attacked, his jaw is locked, and he is bent with convulsions. Here it will be evident that the wound has caused this terrible suffering. If it be a hurt of the finger, it might naturally be expected that by cutting the finger off, you should remove the disease: I have seen it tried, but with the aggravation of every symptom accelerating death. Seeing this, the suspicion naturally arises, that there must be something wrong in the general system; and what so likely to be cause, as the disorder of the stomach and intestines? Undoubtedly the cause of the evil is not to be found there: for in a ship sailing into certain latitudes, or rather, I should say, lying off certain shores; or in an army set down before a city in an unhealthy country; every mariner or soldier who received an accidental scratch, will die of locked jaw; and surgical operations will almost always be fatal.

The conviction now comes home to us, that there are other diseases than of the stomach or bowels; that when the body is thus affected by climate and atmosphere, there is a morbid influence which precedes the disorder of the viscera; that the viscera are disordered in a *secondary* way,

way, that they only afford symptoms of the more general disease.

This is a subject of so much consequence to the surgeon, that I am tempted to state it in another form. A man exposed to a land wind blowing over an unhealthy district, will have his frame poisoned, and yet no immediate symptoms will appear of the disorder; but long after he has removed from the source of disease, it will shew itself in disorder of the viscera. After perhaps the lapse of some time, the physician pressing the belly may easily convey his impression to the patient, that in this region is the seat and origin of all his sufferings, for the liver or spleen is enlarged, and pressure gives pain; but are these therefore the parts in which the disease is primarily seated? There is no proof of this. We overlook the first influence, which fell on that undefined principle of life, (which I know not how to express by a better term, than the constitutional powers,) before these parts suffered derangement; and where this morbid influence first took possession, there it still prevails: although now, as a secondary effect, the parts of slow circulation and chiefly the venous structures suffer and exhibit the symptoms. Hence the congestion in the larger viscera, and the hæmorrhage from surfaces where the veins are numerous and exposed. I shall have occasion to speak of the effect of wounds in this state of the constitution.

XVI. But further, a man returning with bad health from abroad, and having occasion for surgical assist-

assistance, will be found still under the pervading influence of his original complaint: if he has had a stroke of the sun, if he has had the hill-fever of India, or the West India intermitting fever, or the Walcheren fever, the original type of disease will remain, and influence his state of health while thrown down under the surgeon's care: or if any of his vicera be organically diseased, they will be affected by his present state, and will in turn influence the local ailment for which the surgeon is employed.

If a gentleman landing from the West Indies have an erysipelas; if another in the same circumstances complain of intolerable headach and unaccountable swellings on his scalp, the peculiar disease of the climate from which he came, and the history of his constitution, claim equal attention here, as if he were still abroad.

I wish to press these facts on my reader's attention, that he may be aware how little it will sometimes avail him to be able to cure a sore in a London artizan; that he may not rest satisfied with the favourite prescription of a surgeon of reputation, nor with the practice of our hospitals; that he must study his profession in a more liberal way, and know its extensive connection with the SCIENCE OF MEDICINE.

Plate 1.

Fig. 1.

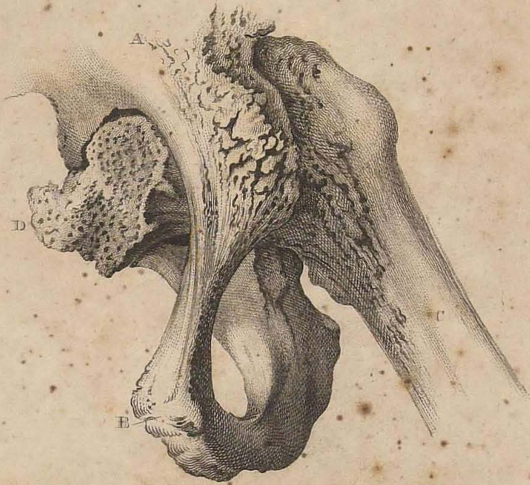


Fig. 2.

Eng.d by J. Stewart

London Pub.d April 1.1809 by Longman & Co.

Plate II

London Pub.d March 1807 by Longman & C.o

Plate III.

Drawn by Chas. Bell

Engd. by Jn. Stewart

London. Pubd. March 1807 by Longman & Co.

Plate IV.

Drawn by Chs. Bell — Engd. by Jn. Stewart

London Pub.d March 1807 by Longman & Co.

London. Pub.d March 1807 by Longman & Co.

SECTION IX.

OF AMPUTATION OF THE LIMBS.

NO opinion which has obtained generally, and for a long time, is totally without foundation in facts. It has been very generally said, that amputation is dangerous in a robust frame or system in full health and vigour; and that this danger is increased, wherever there is inflammation, such as that which follows a severe accident. On the contrary, it is affirmed that there is little danger in the operation, when it is performed on a subject exhausted by irritation, and continued discharge from ulceration, Perhaps the explanation is this, that where the system has been long accustomed to a low degree of action, the tendency to high inflammatory action is subdued; so that when the source of the irritation is taken away by operation, the body is left in a state susceptible only of that due degree of inflammation from the effect of the knife, which is proper for producing a cure; the general inflammatory action being low, and the nervous irritation having subsided. But it is

not true to the extent here expressed, that amputation in a healthy state of the body is dangerous. If a man receive an injury so severe that he must lose his limb, the sooner the amputation is performed the better.

Let me also remind my reader of those tremulous stumps which he must have seen in hospitals, formed of a great sac of loose skin, from the centre of which is presented a long dead bone. This is in general the effect of the great exhaustion and debility in a constitution already much reduced, and where there were not powers to produce adhesion, or to enable the patient to go through the stages of healthy suppuration. When a limb is amputated in this state of the system, it is like the operations we perform in the dissecting room. The muscles and skin are soft and loose, and do not take upon them a due degree of action; or they soon separate from the bone, and leave it dead, with the parts in the state which I have described.

In common practice, amputation is performed ninety times in a hundred, for ulcer with carious bones, and for white swelling of the joints. The young surgeon is anxiously in search of some rule of practice to guide him, in distinguishing the kind or degree of disease which is to authorize amputation; but there can be no such rule. The evidence for the necessity of amputation is the sinking of the strength under the irritation of the disease, when all our resources have been tried in vain.

There

There are cases in which the most experienced surgeon will have difficulty to determine whether amputation will save the patient or accelerate his doom. These are cases of fractures, aneurisms, and gangrene. Surgeons no longer amputate in cases of compound fracture, merely because the bone projects. Fracture of the bone has never in itself been properly the occasion of this operation, nor even when complicated with a simple wound of the soft parts, either from the blow or from the ends of the bone piercing the integuments. It is only when the parts are *irrecoverably bruised*, that we amputate immediately: it is the bruise of the soft parts, and the general injury to the limb, which decides us. The reason for amputating in these cases is this, the parts cannot recover, and presently the whole system begins to sympathise with the debility of the part injured; so that not only that part falls into gangrene, but such a similarity of action pervades the whole body, that you cannot afterwards cut off the limb. If you do attempt to cut it off, the stump will exhibit the same alarming symptoms of gangrene with the original wound. It is therefore upon the general injury, compared with the powers of the constitution, and particularly on the bruising and laceration of the parts, that we have to fix our attention not on and the mere fracture of the bone.

When we are apprized how soon the general state of the system influences the state of a sore or a wound, and that the converse of this in many instances holds true, viz. that an active local disease

induces a prevailing similarity of action in the system at large, we learn to be cautious of amputating in the active state of disease. Violent inflammation we must restrain and subdue, before we amputate; and gangrene must have stopped before we can promise success to the operation. For if this gangrene be spreading from the place originally affected, it is no longer a local action: the general system is already influenced; and the new injury you are about to inflict in the regular form of an operation, is not the less on that account an injury. The gangrene will appear on the stump.

When the injured limb is attacked with an erysipelous inflammation, and is swollen and heavy, it lies an immoveable mass; and when in this state the commencing gangrene has been stopped, still it lies heavy; and often by its insensibility the effect of the pressure on the projecting processes of the bone, as of the heel or ancle, or head of the fibula, destroys the skin, and makes the bones carious. From such a cause, I have seen it necessary to amputate a limb; when otherwise, the gangrened parts, being of small extent, would have sloughed off, and the limb recovered.

A fracture apparently the most dreadful, when seen first, with the limb distorted, and the bones sticking out, and which we are tempted to condemn, does yet, when reduced, lose its frightful aspect; and often by bringing the parts together, we can procure adhesion of the skin, and reduce it to a simple fracture. But when a great artery is

at

at the same time wounded, when operations deep in the flesh of a limb, and amongst broken bones, are necessary, the case is altered; we cannot reduce the fracture to a simple form.

It may in this case happen, that we are enabled to tie the artery above the part wounded, which reduces the wound to a simple compound fracture, if I may use the expression; and if in any way we can restrain the hæmorrhagy, and check the rising inflammation, we ought to defer amputation.

What is called a compound dislocation is not a case for amputation. If a man in dropping from a height dislocates the ancle, and the lower head of the tibea be driven through the skin, the foot is to be saved; we have to replace the bone, to bleed, and keep down the rising inflammation by cold application. But if the joint has been opened, and the bones displaced by a heavy cart-wheel passing over the limb, then the case may be very different. The soft parts may be so bruised as to require amputation: still as in fracture we have chiefly to consider the state of the soft parts.

Were I to enter into the subject of false aneurism and the wounds of arteries, I should anticipate what is more properly to be delivered under the proper head of WOUNDED ARTERIES.

Perhaps the accident the most fully licensed for amputation, is where the knee-joint is laid open with fracture and lacerated integuments. The inflammation of this great joint is in itself pregnant with danger, and will produce fever and irritation to a most alarming degree. But though such con-

 sequences

sequences may arise from a mere puncture of the joint, still we are not always to condemn the limb although it be opened; the joint must be shattered to make the case for amputation. We must confess the insufficiency of general rules to guide us here, since a ball has passed through the knee-joint, and the limb has been saved. I have now under my care a case where the ball lodges on the crucial ligaments, and yet I shall save the limb.

I refrain from further remarks on the general question of amputation, suspecting that they may be to my readers not more satisfactory than the advice which I myself have received from books. The reason of this unsatisfactoriness is, that each case, as it occurs in practice, is attended with circumstances so peculiar, that it will seldom class with our general aphorisms; and frequently in the discussion of this subject, the first surgeons are left in doubt and perplexity. The question of amputation is not to be discussed, I conceive, in a separate dissertation. The necessity of operating will always remain to be determined by our general knowledge, by the consideration of the age and constitution, and of the powers of the system, to bear up against the injury. We must be able minutely to distinguish the nature of the injury; we must narrowly watch the first symptoms of the constitutional affection; we must again observe whether the constitution has not reflected a character to the wound; the circumstance of the patient's situation is to be taken into consideration, his

his age, his habits and way of life, the possibility of his removal with a shattered limb ; — these and many other circumstances will determine our opinion as to the necessity of removing a limb, and sometimes put us to the necessity of acting contrary to the aphorisms laid down in books.

See further Gun-shot Wounds — Diseased Joints — Fracture, &c.

AMPUTATION OF THE THIGH.

Instruments and Apparatus. — See that the following things are laid out in due order: Roller and compress — Flannel or linen roller — Adhesive straps — Lint-compresses for the stump, and Malta-cross — Tow — Sponges and hot water — Wine and water — Ligatures — Cloth retractors. These instruments taken from the case, and laid out, viz. Amputation-knife — Scalpel — Saw — Amputation-forceps — Tenacula, three at least.

The patient is seated on a firm table, with a friend behind to support him in his arms. Attendants are on each side of him to take hold of his hands, while another is seated before him on a low stool, to hold the injured limb. The assistant-surgeon applies the tourniquet; and in general, in a great operation, he settles all the lesser previous circumstances; at the same time assuring the patient, and fortifying his faith in the surgeon.

The tourniquet is applied about a hand's-breadth from the groin. The pulsation of the artery is felt, and the compress put down upon it, and seated there by one or two turns of the attached bandage. On this the tourniquet is applied.

The errors which I have seen committed in this simple and previous step are these: A young gentleman put the roller and compress which is placed under the tourniquet so tight, that the circulation of the artery was not free after the tourniquet was unscrewed, and on the compress being taken off, blood started from the face of the stump. The tourniquet on another occasion was put on with the screw half elevated, and during the operation the moveable piece reached the top of the screw, so that it was impossible to tighten it farther. A young assistant, mistaking the first jet of blood from the distended veins for the springing of an artery, put his whole strength to the tourniquet, until the strap tore upon the buckle. It might have broken it altogether, as happened to Gooch, from this over anxiety. I have seen a surgeon apply the tourniquet with the buckle so near the brass roller, that it checked and prevented the operation of the screw, or the further tightening of the ligature.

Where there is a suspicion of abscesses having formed amongst the muscles, the tourniquet ought to be applied, as far removed from the disease as possible. Should the tourniquet give way, or the tongue of the buckle slip, the mere idea of which is

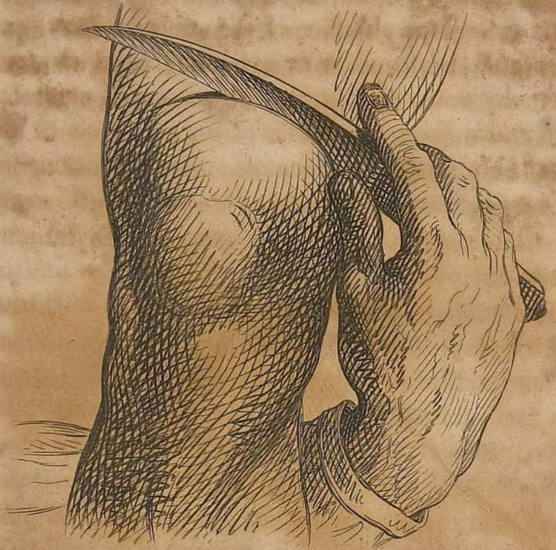
is alarming, the assistant should press his thumb upon the artery, as it escapes from the belly, whilst some one grasps the face of the stump until a new tourniquet be applied, or a handkerchief twisted about the limb, as described in the Introduction.

In this amputation, it is of no consequence on which side the surgeon stands. The operative assistant ought to be opposite to him. He may grasp the limb, but ought not to draw up the integuments during the first incision.

The FIRST INCISION is to be made low in the thigh, but free of all diseased skin; I have seen an amputation in which the matter spouted out on the first incision!—a bad suppurating stump followed.

We may announce the general rule thus: if the inflammation has been of no peculiar kind, and be not at present active; if it has left only a little thickening of the integuments, when the disease was not originally cutaneous nor likely to become so, circumstances may occur to tempt us to make our incision in the thickened and somewhat inflamed integuments. I have seen no bad consequences follow the practice.

To make the first circular incision, the knife is thus held:



1. The arm is carried under the limb, till the knife reach almost round to the same side on which the operator stands. With one sweep penetrating to the fascia, the knife is brought round to the point where it first touched the skin. The meaning of this is, that the cut is more regularly done than by cutting first on one side and then the other; and the patient is saved some degree of pain, where the operation is most painful, in the cutting of the skin.

During this incision, the assistant should not draw up the skin, else he will make it uneven; he should only steady and fix the integuments.

2. It

2. It is only where the integuments have partaken of inflammation, and are stiff and adhering, that it is necessary to carry the scalpel betwixt the fascia and skin, and to turn up the integuments thus:

3. If this has been necessary, the surgeon taking the amputating knife again in his hand, and placing it close to the inverted integuments, cuts down to the bone, and carries his knife round with one sweep, as in the first instance.

When the integuments of the thigh are not rigid by former inflammation, but naturally pliable, the surgeon sets on the knife (holding it as before) close to the retracted integuments, and again makes an incision at once in the entire circle of the

the thigh, and cutting down to the bone. If the assistant does his duty, the surgeon cannot do so awkward a thing as to wound the integuments were he blind-folded; for the assistant taking a slip of linen betwixt his hands, and putting the edge of it close upon the muscles, on the under part of the thigh, he protects, at the same time that he draws the whole circle of the integuments up.*

4. When the muscles are cut through, the assistant takes his split cloth, or piece of canvas, and passing the slips on either side of the bone, he twists the extremities a little, and pulls the whole flesh upwards, thus:

* I have thought it an improvement in this part of the operation to extend the leg in cutting the anterior muscles, and to bend it while bringing round the knife to cut the posterior muscles. This cannot be always done.

The

The surgeon now clearing the surface of the bone a little, and pushing up the cloth and soft parts, applies his saw close upon the retracted parts. There is no other precept to be given in regard to the sawing of the bone, than to carry the saw very lightly.

5. And to saw upon the side of the bone, not beginning on the upper part. This permits the saw to play more freely, and prevents the splintering of the bone. During the sawing of the bone, the assistant or pupil, who holds the leg, must keep it very steady; the limb being taken off, the surgeon's next care is to feel the surface of the bone, and to take off any sharp point or roughness, by the application of the amputation-forceps.

6. The surgeon now proceeds to tie the arteries: first he pulls out the femoral artery from its sheath, by the inside of the bone, (if the limb be amputated at the usual place,) and ties it. Then, on the outside of the bone, he seeks for the larger branches of the profunda femoris, and finding these, he requires the tourniquet to be slackened, that the blood may flow and shew the others.

The considerable branches of the arteries are to be sought for in the cellular interstices of the muscles. Sometimes the main artery shrinks so into the sheath of the triceps, that it does not bleed or shew itself readily, in which case the sheath is to be cut open, when the mouth of the artery is discovered.

The

The number of vessels taken up in general, is from five to eight; but if the artery has been in high action, or aneurismal, many more vessels may require to be tied. The arteries are to be transfixed with the tenaculum, and drawn out, carefully avoiding the accompanying nerve. In making a deep plunge with the tenaculum, for the femoral artery, we are in danger of drawing in the extremity of the nervus cutaneus longus. I find it very often taken into the ligature. This, if attended with no worse consequences, will certainly occasion many severe and tedious dressings to the patient, and will often destroy the healthy state of the stump.

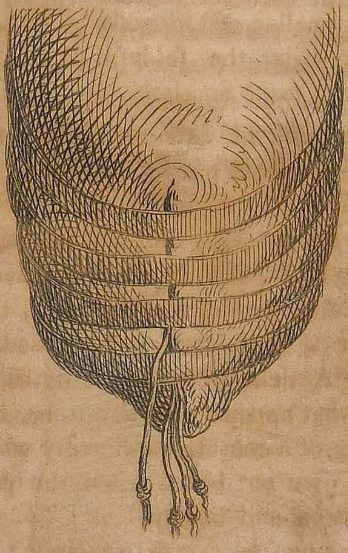
7. The tourniquet is now to be entirely removed, when that oozing of blood from the veins, which is a consequence of its loose application, will cease. The integuments being put lightly together, the operation finished, and nothing painful remaining to be done, the patient should have a little cordial, be raised, and encouraged. A delay of a few minutes now may shew that what appears a little oozing, is, in fact, the bleeding of a considerable artery which begins to act and give out blood when the patient has become revived and hearty.

It is sometimes necessary to include the femoral or the saphena vein in a ligature. The veins being enlarged, and having lost the use of their valves, a large column of blood is sometimes thrown from them. But unless there be a necessity for tying the veins, it ought not to be done.

 The

The integuments are now sponged as dry and clean as may be,' the muscles pressed forward to close over the bone, the ligatures are arranged, (so that they may not be entangled when we come to draw them of,) and the skin brought down over the surface of the muscles.

8. The integuments are brought together from either side, thus; and the greater number of ligatures brought out by the lower angle.

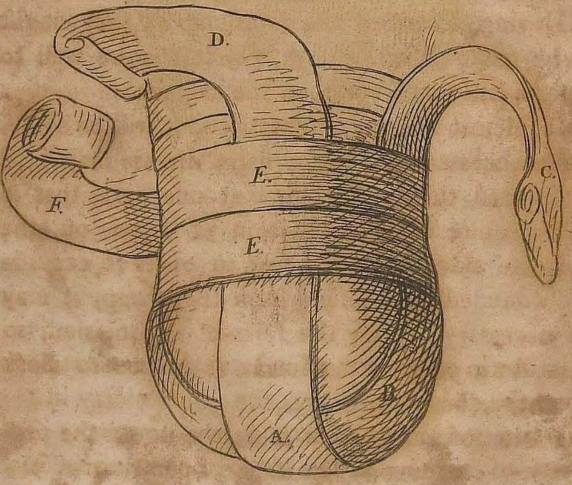


9. As in so great a wound our desire must be to procure adhesion quickly, the chief nicety in the operation of amputation is in the dressing. The surgeon compresses the face of the stump with a dry cloth, to suppress in this way the slightest oozing,

oozing, and keep the skin dry for the application of the adhesive straps. The assistant having heated his adhesive strap, brings it, and fixes it on one side of the integuments, the surgeon with a motion of his finger (still keeping the flaps together) fixes it over the lips of the wound; while the assistant stretches out the other end of the strap over the face of the stump, and upon the thigh. Four or five of these straps bring the integuments accurately and neatly together.

Over this we place a web of scraped lint, with some smaller soft dossils; over this some fine tow, betwixt the folds of a piece of old linen, so as to make an elastic cushion.

Lastly, the whole is retained by the Malta-cross, (two pretty broad slips of linen, joined across each other,) which is thus applied over the dressing, the



Malta-

Malta-cross, or cross slips of linen, A, B, C, D, are applied. The flannel roller put once about the waist, and pinned up previous to the operation, is ready to be brought down and rolled upon the thigh towards the stump. When it covers the thigh within a hand's breadth of the stump, the ends of the cross slips of linen, D, C, are put down and bound by the remaining turns of the roller E E. The slips D, C, are now drawn in due degree and pinned down.

The tourniquet is put loosely about the limb.

The patient is to be carried to bed, and laid on a mattrass; the stump laid on a soft pillow, or bedded in soft tow or cotton. It is then pinned down to the bed by a broad piece of linen, and a cradle is put over it, to keep from it the weight of the bed-clothes.

Having described the incisions as they ought to be made in common cases, it may be well to enter a little more fully on the subject.

In almost all the amputations, it will be sometimes necessary to form a flap; disease may have so injured the integuments at one part, that it will require a larger portion of them on the opposite side to be left; or in order to exclude the wounded integument from the stump, it may be necessary to vary the form of the incision, so as still to preserve sufficient substance to close upon the end of the bones.

When a student, I wrote an essay on the propriety of making a flap in the operation of the thigh; but having occasion to see the amputation

 well

well performed by the double circular incision; the bone well covered, the cure rapid, the face of the stump broad and large, with a mere line marking the union of the skin, I was convinced that the circular operation could not be improved; I have often reflected on this circumstance, when I have heard of different improvements on this operation.

Some have recommended, that the knife be so used as to make the face of the stump like a funnel, the centre and deepest part of which is to be the bone. What is this, but digging away the substance of the muscles? and now we read of the amputation by the *triple incision*. This is practised by cutting through, by a circular incision, what are called the first layer of muscles; but this is an ignorant term. What are the superficial muscles of the back of the thigh? or of the arm, or fore-arm? It can, therefore, only mean some management in regard to the cruralis in the thigh, or the brachialis internus in the arm. I have seen this attempted, and it makes a ragged surface of muscles, by an operation somewhat protracted. It turns out to be a method of cutting the muscles shorter, not of saving substance, for it amounts to this only, that the deeper muscles are cut through higher than in the common operation. But can any thing be better than the common operation when dexterously performed, and with due calculation. When we bring forward the muscles, we no longer see the bone; it is sunk in their substance; when we bring forward the integuments,

ments, they cover the muscles, and meet in an accurate line ; the rest depends on the dressings, and the state of health in which the patient finds himself.

AFTER DRESSING.—Until the third day from the operation, we have nothing to do but to consult the feelings of the patient. Some uneasiness must be expected; but unless there be twitching, or spasm, or much restlessness, I avoid opiates. There may be tightness of the dressings, and pain from the binding, which may induce us to remove a few turns of the roller, or ease the ends of the cross bandage on the face of the stump, or there may be an oozing, which may cause us to draw them a little tighter, or to keep the pupil in waiting more narrowly on the watch ; but ten to one that nothing of this kind will be necessary until the third day.

But even on the third day I would not take off the intire dressings, nor apply a poultice to soak the dressing. Let the roller be undone, and the compresses be taken off, so that the degree of redness in the flaps is seen; but if all is right, no unusual softness, no great degree of tension and swelling, nor drawing of the integuments upon the adhesive straps, the further exposure of the wound is unnecessary. The dressings may be put on again with somewhat of a slighter degree of compression.

The dressing on the fifth day should be complete: every thing may now be removed. If the moisture of the wound, and the suppuration, has not

 been

been sufficient to soften and loosen the dressing, a large poultice is to be put on the stump for an hour, after which the dressings come easily off.

When the stump is exposed, we expect to find the integuments adhering to the parts below, and, perhaps, in part, at their edges. We feel and press gently on the integuments, that no collections of matter may lodge under them. If matter has been collecting, we put a soft compress over it, so that when the bandage is put on, the sides of the little cavity may be kept in contact. The adhesive straps are now put on, so as to cover the integuments where they were left bare in the first dressing.

The dressing of the stump is, after this, a daily duty: and, on the fifth dressing, we may gently solicit the ligatures from the lesser arteries. By the management of the straps, the face of the stump may be as it were modelled into form; so that those angles which have given rise to ingenious novelties in the manner of operating are greatly removed.

AMPUTATION OF THE LEG BELOW THE KNEE.

First, of the common operation by the circular incision, a few inches below the knee.

The change necessary on the apparatus is only the addition of a catiline knife, the adaptation of the dressings to a smaller stump, and the retractors slit so as to form a slip for passing betwixt the tibia and fibula.

The

The tourniquet may be applied on the thigh as above, or it may be placed a little above the knee, with the pad or the compress betwixt the ham-string tendons.

The patient and assistants are placed as in the last operation; the surgeon stands on the inside of the knee.

1. The circular incision of the integuments is made, (about two hands' breadth below the patella,) and the skin drawn back, and separated from the tibia and the muscles on the back part.

2. The muscles are now cut through with a circular sweep of the great amputating knife, as in the operation on the thigh. But my reader will understand from the form of the bones, and the manner in which the muscles lie betwixt them, that they cannot be intirely cut through by a sweeping circular incision.

3. There is another reason for the surgeon laying aside the large amputating knife, and taking a moderate sized scalpel. It is not possible to procure the retraction of the muscles without cutting across, not only the general fascia, but the internal connections of the fascia which descend in the interstice of the muscles. It is upon the unbridling of these membranous connections, that the right performance of this amputation depends. After freeing the muscles, they are to be powerfully retracted.

4. In the sawing of the bones of the leg, there is somewhat more caution necessary than in the sawing of the thigh bone. The meaning of the

surgeon standing on the inside of the leg, is that he may rest the stress of his saw on the firmer tibia, and while he is making progress in cutting through the tibia, the fibula is at the same time cut across. Some surgeons cut across the fibula, and again apply the saw to the tibia; which I think the best way: let the saw be still moved perpendicularly. When the tibia is cut through, I saw off he sharp projecting angle, formed by the anterior spine: the arteries are now to be secured.

The anterior tibial artery lies before the interosseous membrane, and betwixt the extremities of the bones.

The fibular artery lies behind the fibula.

The posterior tibial artery lies to the inside of the last, and among the fibres of the soleus, near the tibia.

These must all be secured. The lesser branches, which require the ligature, are—that small artery behind the tibia which gives off the nutritious artery, and the muscular branches on the outside of the gastrocnemii, and in the substance of the gastrocnemii and soleus.

5. The dressing in this operation is much the same as in the last operation.

But unfortunately the great size of the tibia, and the thinness of the integuments over the fore-part of it, makes it somewhat of a more precarious operation than the amputation above the knee. We must be particularly careful in applying the adhesive straps and bandages, that the skin be not pressed against the sharp edge on the fore-part of the tibia. The neglect of this precaution, with

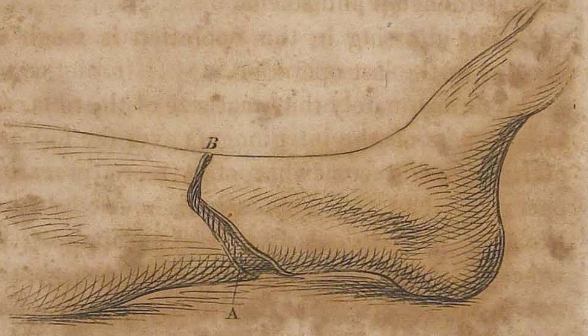
with the great size and superficial situation of the bone in the stump, is frequently the cause of a tenderness and suppuration in the skin, — and a caries of the bone may be the consequence.

AMPUTATION NEARER THE ANCLE.

WHEN the disease is in the foot, and the patient young, it is better to amputate lower in the leg, where the bone is smaller; yet not so low but that there may be sufficient muscular substance of the soleus and flexor muscles to cover the face of the bones.

Whether we perform the flap operation, as it is called, or not, still here we must contrive so to manage the knife that there may be a sufficient length of muscular substance (and of integuments to cover that muscular substance) to admit of the back part of the flap being brought forward over the face of the bones.

The FLAP OPERATION may be thus performed:



1. With the large amputating knife we make an oblique cut upwards, through the skin of the back part of the leg. The assistant drawing up the skin, we enter the knife again at the upper margin of the cut, A, and carry it obliquely upward until it reaches the bones. Holding the knife steady in the wound, the edge resting on the tibia and fibula; let the surgeon observe if the flap now formed be large enough, compared with the remaining diameter of the limb, to cover the extremity of the stump; if it be not, he is to carry the edge of the knife a little further upward, keeping it still close upon the bones. The knife is then (without being withdrawn) to be carried in a circular direction, B, over the tibia and fascia, which covers the tibialis anticus, until it meets the angle of the first incision, on the outside of the limb.

2. The assistant continuing to pull the integuments up, the surgeon takes a sharp-pointed scalpel and pierces the interosseous membrane, and separates the ligamentous partitions from the bone.

3. The sawing of the bone being made with the same precaution as in the last instance, and the arteries being secured, the flap is brought up upon the face of the bone, and the point, A, meets the integuments, B.

Thus, if adhesion be procured, or if the flap connects itself after suppuration, a cushion is afforded to the ends of the bones, and the patient may probably be able to bear his weight upon a false leg and foot, by which he has the use of the joint of the knee.

 The

The method I have here described I prefer to that manner of operating in which the catiline is thrust down behind the bones, and then made to cut its way out obliquely downward, so as to form the flap.

The vessels to be taken up are still the same, nearly, as have been already mentioned. The posterior tibial artery and the fibular are very near each other. The tibialis postica in the interstice betwixt the tibialis posticus muscle and the flexor digitorum. We have to take care that the nerve is not pulled out along with it. The fibular artery lies near the fibula, and betwixt it and the flexor pollicis magnus. The tibialis antica is before the ligament, under the extensor communis, and betwixt the tibia and fibula.

In the dressing of the stump, the same precautions are used to bring up the flap over the face of the stump, and to support it by straps, by an elastic cushion of lint and tow; and yet to be careful that the flap does not press too much or unequally on the ends of the bones. Let the dresser take particular care in bringing down the muscles of the back of the leg, before he applies the roller.

OF THE AMPUTATION OF THE TOES AND FINGERS.

The amputation of the metatarsal bone of the great toe may be necessary, or that of the metatarsal bone of the little toe; but I conceive, from what I have seen of the pain and difficulty of extracting

tracting any of the intermediate metacarpal bones, and considering the effects of such a torturing and tedious wound among the bones and ligaments of the foot, that it should not be performed.

But instead of a formal operation, under the title of amputation, I have no doubt that the careful and nice extraction of the spoiled bones from the hand or foot, in caries, should be oftener done than it is.

In the amputation, where the surgeon endeavours to dislocate the square head of the metacarpal bone, the patient is kept long in extreme torture, and the diseased bone is generally broken in the surgeon's fingers. On one occasion, a patient (though certainly in a very unfavourable state of health) died in consequence of the operation, from the immediate nervous irritation. Instead of dislocating the head of the bone, it is better to cut it with the trophine. I have adapted an instrument for this purpose. By cutting away one half of the cylinder of the trophine, it is made to saw the bone with the remaining half.

When the metatarsal bone of the great or little toe is to be taken out, the incision is to be made thus: 1. First, we carry the scalpel round the root of the toe, and then down the side of the foot.

2. Then the flaps are to be dissected back: the metatarsal bone of the great toe is to be separated from the next, by passing the knife betwixt them; and now, notching upon the square head of the metacarpal bone, where it unites with the carpus, we may press it down and unfix it.

The tendons must be cut short, so as not to lie exposed in the wound.

3. The artery which bleeds on the fore-part of the foot is the extremity of the tibial artery, where it is passing betwixt the head of the metatarsal bones of the great toe and the second toe. The lesser artery in the sole, is the internal plantar artery.

4. The arteries being secured, the flaps are simply brought together, and secured with straps, compresses, and a roller.

The

The amputation of the toes and fingers is done at the joints.

1. I find the simple circular incision to be preferable in amputating the fingers or toes. Observing the exact place of the joint, make the incision beyond it so as to have sufficient integument to cover the face of the bone.

2. Draw up the skin and dissect it from the bone; then bend the finger to ascertain the middle of the joint, and cut down on the lateral ligaments of one side of the joint. This gives the head of the bone freedom; and upon cutting the ligament on the other side, the finger is separated.

3. As the arteries are generally in an enlarged and active state from the disease, they may require to be tied. It should be done with the dissecting forceps. If the skin has been neatly cut, it requires only to be put together with one adhesive strap, and the hand bound up.

AMPUTATION OF PART OF THE FOOT.

When the fore-part of the foot is destroyed by some violent injury, or when the metatarsal bones are carious, it may be possible to cut off the fore-part and save the heel. This operation is to be attempted only in such subjects as are young, and in good condition of body.

1. One incision is to be made across the upper part of the foot. 2. Another incision is to be made, two inches more forward than the first, across the sole of the foot. 3. An incision is then to be

made

made on the outside, and another on the inside of the foot, joining the two first together. 4. The integuments are to be dissected back, and the bones sawn across, so as to remove the diseased portion of the foot. 5. The arteries being secured, the flap formed of the muscles and integuments of the sole of the foot is to be brought up to cover the face of the bones, and unite with the integuments above.

AMPUTATION ABOVE THE ELBOW.

THIS is the most simple operation in surgery. It is performed with the double circular incision. If we take care sufficiently to secure the main artery freed from the radial nerve, and bury the end of the bone well in the flesh, no bad consequence can follow, but from some strongly prevailing evil tendency in the habit.

AMPUTATION OF THE FORE-ARM, BELOW THE ELBOW-JOINT.

THE amputation of the fore-arm is generally done by the double circular incision. This attempt has a peculiarly awkward effect in the hands of the young surgeon. I prefer making an incision of the nature of a double flap.

When we grasp the fore-arm, we feel the spine of the two bones running quite superficial; and on the inner and outer sides of the arm, we feel the mass of flesh of the two classes of muscles, the flexors and extensors. On these muscles must we depend for covering the face of the radius and ulna; and

and we obtain more of them by making a semicircular incision on the inside of the arm, (making a flap of the flexor muscles,) and another meeting the first at the extremities of a gentle curve through the extensor muscles.

By dissecting these two flaps up a little, and sawing the bone deep, we get a good mass of flesh to cover them, and we have the advantage of retaining the skin in adhesion to the muscles.

Four arteries will be tied—the radial and ulnar; and a lesser one on each side of the interosseous ligament.

In dressing the stump, we must, as in every case of amputation, be careful to avoid pressing the soft parts against the extremities of the bones, until they are somewhat rounded by absorption; and yet much of the success of the operation depends on the equable degree of support which is given to the stump.

In no amputation are needles to be used; the adhesive strap and the right application of the roller is quite sufficient to bring the edges of the integuments together, and to retain them.

OF THE AMPUTATION AT THE SHOULDER-JOINT.

THE necessity of amputating the arm at the socket of the bone, arises for the most part in consequence of gun-shots carrying off the arm, and leaving it ragged at the shoulder; or of gun-shot fracture of the humerus, or of a wound of both the bone and the artery near the axilla. Disease of

of the humerus may give occasion to this formidable operation.

The amputation of the arm at the socket is undoubtedly a very formidable operation, however familiarly our army and navy assistant-surgeons may speak of it. — It requires a peculiar kind of dexterity, and a velocity of motion in the hand, very different from what constitutes the perfection of operating in other cases. An error or tardiness in the operator may not only prove fatal, but a want of knowledge, or even of strength in the assistants, may be attended with fatal consequences.

1. Place the patient upright on a chair; put a sheet or table-cloth round the body; and under the arm to be cut off, let the extremities of this cloth be held by a stout assistant. This is intended to support the patient, when the assistant surgeon is pressing his thumb upon the artery, and without this precaution, the patient losing blood, and sinking under the pressure which it is necessary to make above the clavicle, the pressure will be ineffectual, and the artery be left free.

2. Let a stout assistant surgeon stand behind the patient. He is to place his thumb in the hollow above the clavicle, and to press the subclavian artery against the first rib. Let him reserve his most powerful exertion for the latter part of the operation.

3. The surgeon takes the large amputating knife, and holding it like a sabre, he uses it much after the same fashion; with the left hand he grasps the

mass of the deltoid muscle; he then cuts through the integuments, and deltoid muscle near its insertion into the humerus, and changing the direction of the edge of the knife, he draws it so as to lift up the whole of the deltoid muscle, leaving it at its origin.

4. The next part of the operation is to sink the scalpel into the cavity of the shoulder joint, then the arm bone being drawn down by an assistant, room is given to introduce the fore finger of the left hand into the joint. The ligament is then cut from the glenoid cavity, the finger being the directory. Then keeping the edge of the knife close to the neck of the humerus the bone is separated from the soft parts; and the elbow being permitted to drop, the head of the bone rises free from the flesh of the arm.

5. One motion of the knife cuts through the remaining flesh of the arm, and with it the artery and nerves.

6. The artery is drawn out and tied.

7. The muscular arteries are sought, and secured with ligatures.

8. Particular care is taken to see that the extremities of the nerves are lodged deep. The flap is let down so as to cover the lower part of the wound, and being secured by adhesive straps, the dressings are kept in their place by the spica bandage, which is a double-headed roller brought round from the opposite side of the body, and crossed over the shoulder.

Every

Every one knows the difference of stopping the pulsation of the artery, and stopping the flow of blood through the artery.

It is no security against hæmorrage that the surgeon feeling the wrist before proceeding to the operation, finds that the pressure of the assistant has stopt the pulse; notwithstanding this, blood flows from the vessels during the incisions, and velocity is necessary to success. The dependance which the surgeon is obliged to have upon his assistant in this operation, must often render the operation impracticable. In some cases the following method may be preferred:

1. Place the tape of the tourniquet in the axilla, and the instrument itself on the top of the shoulder, and screw it tight; the artery is thus secured.

2. Make one decided cut with the large knife across the inner part of the arm. The mouth of the artery is seen gaping and quite distinct, and may be leisurely tied free of the nerves.

3. Cut or loosen the tape of the tourniquet, and make the flap by turning up the deltoid muscle.

4. Cut across the ligament, and separate the humerus, and secure the lesser arteries.

The advantage of this manner of operating would be the leisure and security in tying the great artery, without losing a drop of blood. The appearance presented is in effect the same as when the operation is begun by forming the flap.

Very often it must occur that the place of the wound, or the destruction of integuments, will

 produce

produce a necessity for varying the manner of making the flap in this amputation, and which of course must be left to the surgeon's judgment.

GENERAL CONCLUDING REMARKS.

Hæmorrhagy, after amputation, may be the effect of insecure tying of the principal artery; and then it will be very terrible indeed. The surgeon will sometimes be conscious that from the faintness of the patient during the operation, he has been obliged to dress the stump without securing all the arteries of the second class. He has, perhaps, got only one or two secured, when in general amputation at the same part requires five or six branches to be secured. With the reviving strength, the arteries bleed, and the dressings have to be taken off, and the face of the stump has again to be laid open!

It may happen that the integuments do not adhere to the face of the stump, the flesh hangs loose, and the arteries, from want of due inflammatory action, are insecure. Or it may happen that the stump opening, and becoming deeply ulcerated, the arteries are opened, and bleed profusely. Bleeding from this cause may even happen in the third week.

The history of the operation shows us that the effect of the single incision, in which the knife was carried down to the bone at once, was the pyramidal stump. Ravaton said that few escaped by that operation without the bone projecting. Spasms were common and most severe. There were generally

generally three or four exfoliations; and often the surgeon had to cut off the bone at the distance of some months. To the student the excellence of the London hospitals is, that there is much good and not a little bad surgery; and in the season he will seldom miss the opportunity of seeing a variety of bad stumps.

When the bone is left long, and is not completely buried in the flesh, the muscles and the integuments will shrink further from the bone. It is left bare and unsupported, and dies. It exfoliates; but even after exfoliations, it is sharp, and perhaps projecting, and in the end forms the apex of a tender conical stump, which is liable, on many occasions, to have the cicatrix break out in ulcerations; and it is quite unfit to bear upon a wooden leg.

When by necessity or accident the modern surgeon leaves too little skin, well aware of the consequence — an open sore and tedious cure, and a sugar-loaf stump — he becomes perhaps too anxious to correct the deficiency; and drawing the integuments strongly over the face of the stumps by stitches, or other violent means, he only produces irritation, inflammation, and a further retraction than otherwise would take place.

I am inclined to think that in general practice the patients are too long kept in bed. As soon as the arteries are secured, and the ligatures come away, the patient ought to be raised from bed, and if convenience offers, carried into well-ventilated and fresh apartments.

In crowded hospitals, fever, infectious erysipelas, or gangrene, are to be dreaded. Then we soon find the parts separate, and fall loose; the integuments wasted and thin, hang like a pouch over the bone, which projects black and dead. Now our only hope is more generous diet, change of air, wine and bark, by which the patient may be revived, the bone thrown off, and the soft parts fall into a better suppuration. But here the effect of all our precautions during the operation is lost; for if the patient survive the suppuration, the stump is conical, weak, and unable to suffer pressure. In this way a conical stump may be sent out from the hands of the most dexterous surgeon.

AMPUTATION OF THE PENIS.

Instruments:—Scalpel; two tenacula; dissecting forceps; sponge; lint, &c. The surgeon will find occasion for two assistants. Simple as the operation is, I have taken up six, and have seen eleven vessels tied on the penis, after amputation of a large cauliflower excrescence.

The young surgeon must well remember the necessity of carefully distinguishing the cancerous disease of the penis from the more common warty excrescence. I have seen a man just about to lose his penis, on account of a combination of phymosis with these warty excrescences from the glans, and which had burst through the prepuce with a very malignant-like distortion. But the prepuce being freely cut open, the

luxu-

luxuriant crop of harmless warty excrescences started forth.

The penis has been cut off when the prepuce was the sole diseased part.

A tubercle formed in some of the glands of the preputium is often the beginning of cancer in the penis. It is at first an irregular warty excrescence, with a broad base, in the substance of the preputium, or on the frenum. Of the advanced state of the disease, the following description was taken when the parts were before me.

Within the open sore it is a dark red, covered with a sanious discharge: the bottom of the sore is not spongy, but solid: there are deep excavations — irregular, cauliflower-like excrescences: the margin of the skin is swelled, tuberculated, and standing out from the sore, whilst the irregular ridgy edge is curled inward. The skin in the neighbourhood has a purple colour, is thickened and hard; the discharge offensive and peculiar in smell: the urine sometimes bursts out aside from the erosions of the urethra.

OPERATION.

I HAVE formerly said, that when the penis is to be amputated for a corroding, spreading, or gangrenous ulcer, the operation should, if possible, be delayed till the high excitement and rapid progress of the disease be subdued; but in fact these are not cases for the operation.

 The

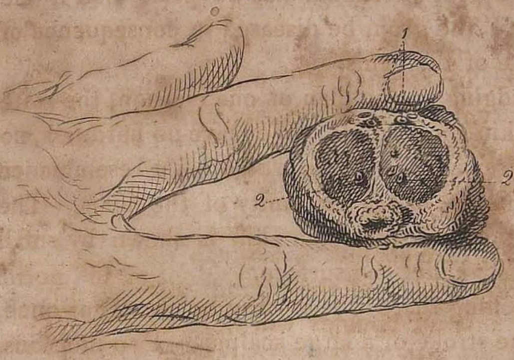
The operation should not be performed if the glands of the groin be diseased in consequence of the state of the penis.

In judging of the plan of our incision, the state of the skin is our guide. We leave no hardness, no coil of vessels, nor speck which has a resemblance to the disease of the extremity of the penis. The confirmed disease in the skin is shewn by small grains felt under the surface.

Stretching the penis, it may be cut off at once, with one stroke of a large scalpel. Two incisions, I believe, will be better; but in doing this we may recollect that we need have no precaution here of saving the skin. The length of the integuments is an inconvenience afterwards.

When the body of the penis is cut through, it shrinks from the assistant's grasp, and is buried among the integuments. It is now that assistance is necessary to the surgeon; for the penis retracted within the skin bleeds freely. The assistant must, with his fore and middle finger, push back the integuments, so that the body of the penis may be made to protrude. He should at the same time grasp the body of the penis with his fingers of the other hand, so as to do the office of a tourniquet.

As the operation advances, the skin becomes more troublesome, and though it appeared that you began your operation within an inch and a half of the glans, the penis will soon have shrunk as it were into the perineum.



The chief vessels to be taken up, are, 1. The dorsal arteries. 2. Those two, which run near the septum in the spongy body. If these four vessels, branches of the internal pudic, are tied, the patient will not probably be further disturbed with bleeding; but it must be remembered that these arteries and their branches are enlarged in proportion to the size of the tumour and the activity of the disease; and that, as much of the disease is in the prepuce, its arteries (from the dorsalis penis and the middle external pudic) are much enlarged, and may require ligatures. *

Should there take place, after all our care, a bleeding or oozing to any extent, we have it in our power to compress the penis with a bandage, in-

* The practice recommended, of disregarding the bleeding from the arteries of the penis, must have arisen from looking upon these vessels in the natural state of the parts, not surely from experience in practice.

troducing previously a female catheter or silver tube into the urethra. But as the stump contracts very much, I fancy this will sometimes not be very easy. I have never seen it necessary.

The skin is brought together by a single strap across; dry lint is put above this, and a broad band made to come up from betwixt the legs. The only care should be to keep the urethra free at the lower part of the wound. To do this no contrivance of bougies will be necessary; but if the integuments are hanging long over the stump, as they have no glandular apparatus for defending them from the urine, they may become very troublesome, from swelling and excoriation.

We may be under the necessity of using the bougie, after the healing of the parts, from the contraction of the extremity of the urethra.

SECTION X.

OPERATIONS ON THE EYE.

THE operations practised on the eye do not require a finer intelligence betwixt the mind and hand, than the performance of what are called the greater operations of surgery. The operation of lithotomy, or that for hernia, requires a more distinct idea of what is to be done, and a steadier and more determined hand in the execution, than either the operation of extracting or depressing the cataract. They are all of them pure dissection; and it is impossible to contemplate without horror a dexterity in these operations obtained in any other way but by the exercise of anatomy. The movement of the instrument in the operations practised on the eye, differ more by the minuteness of the motions, than in what may be termed dexterity of hand; and this steadiness and minuteness of the motions of the fingers can only be acquired by long habit, in preparing the organ of the senses for demonstration.

I hope the surgeons who are in the general practice of operating will see it to be a duty to practise the operation on the eye also. There is no

no other hope of keeping this department of practice respectable, and none certainly of seeing it improved.

In considering the present state of practice of the professed oculist, we miss that featness and dexterity which was so conspicuous in the pretensions, and ended in the practice of the older oculists. I rather imagine the public are benefited by the want of that Charlatan dexterity, which deterred the surgeon from attempting similar feats; but it is notwithstanding very observable, that the improvement even in the manner of operating has resulted from the anatomist's and surgeon's interfering in this branch of practice, and that for the same reason we have gained in knowledge of principles. — We shall find proof of this as we proceed.

OF THE CATARACT.

The cataract is the chrystalline humour of the eye, become opaque. It is characterised in the beginning by these symptoms. The person has a haziness before his eyes, he thinks he sees black specks or flies, or streaks of black, moving before him, the vision is indistinct, and rather diminished in strong light. Upon inspecting the eye, there is a whiteness and turbid opacity observable in the pupil. Sometimes there is only a cloudy opacity to be seen in the pupil, oftener the whole pupil is of a greyish colour, or it is of a deep milky whiteness. Sometimes the lens suffocates the rays without

without either reflecting them, so as to produce whiteness, or transmitting them to the retina.

This is an affection not peculiar to any age, though more common after the middle age. Sometimes it comes suddenly, though oftener very gradually. It may arise from inflammation: in some rare cases it has been dispersed by a casual inflammation.

When the cataract comes as a consequence of a blow, or of inflammation, it ought to be a reason of delaying the operation as long as possible, for such opacities will sometimes spontaneously disappear.

The following circumstances previous to operation are to be attended to. 1. Is the patient, though blind, still sensible of the variations of light, does he distinguish when an opaque body is passing before his eyes, or can he distinguish light from darkness? The reason of attending to this circumstance is, in order that we may discover if the retina be yet sensible, though the rays of light are with difficulty transmitted to it, through the opaque crystalline humour. 2. Is the iris still moveable? Because if it still enjoys its motion, light being its only stimulus, and the retina being alone sensible to light, it indicates the sensibility of the retina, and the healthy state of the organ. 3. Further, in the motions of the iris, we have to observe if the pupil remain perfectly regular. The irregularity of the pupil is, most probably, owing to some adhesion of the cataract to the edge of the iris, and indicates to

us,

us, that there has been a deep inflammation there. The irregularity of the pupil is an unfavourable circumstance, but not a bar to the operation.

4. The cataract which has arisen from a blow on the eye, or after violent and deep ophthalmia, is, for the same reason, unfavourable for operation; since it is reasonable to suppose, that the membrane of the lens has been thickened, and has formed a firm adhesion to the surrounding parts. But fortunately the cataract is not often preceded by this inflammation.

5. When we look into the eye, to discover the seat of opacity:—we look first nearly perpendicularly into the pupil, but then we must turn the patient's head gradually, until we see the profile of the cornea; then if the opacity should be caused by an effusion in the back part of the cornea, it is distinctly seen to be anterior to the iris.

6. The deep black transparency of the pupil, and the want of motion in the iris, will distinguish the amaurosis from the cataract.

7. The disease called *amaurosis* is a want of sensibility in the retina, attended with a dilated pupil and fixedness of the iris; let it be remembered, that the impression of light upon the sound eye will cause a variation in the state of the pupil of the deceased eye. Therefore, when we examine the state of the diseased eye, to observe the mobility of the pupil, and the sensibility of the retina, the other eye must be closed.

8. The cataract may be of a consistence firmer than the lens is naturally; it may be soft as cheese; it may flow liquid like milk, when punctured, but I know not how to foresee these distinctions by attending to the appearance of the cataract, before operation.

9. The opacity may not be in the lens, but in the capsule of the lens and the anterior part of the capsule, or the posterior part of it may be the seat of opacity.

Surgeons of eminence, and oculists, still dispute this point, *viz.* whether the depression or extraction of the cataract be the preferable operation. The depression of the cataract is done by introducing a needle into the eye, and removing the opaque lens from the axis of the eye. The extraction is a very improper term, but it means the making an incision into the cornea, by which the cataract escapes, being pressed forward by the vitreous humour. In the performance of these operations, the utmost delicacy is required, and they have a result the most interesting of any of the operations of surgery. Although the general opinion, at present, be in favour of the operation of couching or depressing the cataract, yet all I have seen makes me prefer the operation of extraction. There is a third mode of dissipating the opacity, which I shall also notice. I shall, however, in the first place, describe the operation of couching the cataract.

OF

OF COUCHING, OR DEPRESSING THE CATARACT.

INSTRUMENTS. — Some surgeons fix the eye with the points of the fingers pressing the under eyelid. If a speculum be necessary, the wire speculum is to be preferred. Professed oculists are eloquent in praise of the shape of their needle: I prefer a needle spear-pointed and flat, with the point a little turned. The advantage of having the point bent, is, that it admits an additional motion of the point, by merely turning the handle; and this rotatory motion of the instrument gives a velocity to the motion of the point very useful in gathering the shreds of the membranous cataract, or in pushing the loose portions of the cataract through the pupil. If the eyelids be much affected with a chronic inflammation, we ought to endeavour to correct this, previous to the operation. But if this is obstinate and habitual, and to no great extent, it makes no objection to the operation. No cross light must be admitted into the room; the north light is to be preferred, and it should strike obliquely on the eye.

1. The patient is seated on a chair, with a long upright back. A pillow is placed to receive his head; the assistant stands behind him to press his head upon the pillow, and in part to support it with his breast. A napkin is thrown over the other eye.

 2. The

2. The assistant lifts the upper eyelid with the wire speculum, and at the same time fixes the eyeball; or the eye may be fixed thus. The assistant puts the points of his fore and middle finger on the upper eyelid, and raises the eyelid, at the same time he gives a slight pressure to the eyeball, but rests his fingers on the margin of the orbit, so that what pressure they give to the eye may be steady.

3. The surgeon sitting down before the patient, places his foot upon a stool of such a height, that when the elbow rests on the knee, the hand may be opposite the eye. Now with the fingers of one hand, he presses down the lower eyelid, and when he wishes to fix the eye, as he is about to introduce his needle, he pushes upon the eyeball with the point of his fingers. It is to be particularly observed, that any change of the degree of pressure on the eyeball during the operation, is to be made by the motion of the operator's fingers, the assistant has only to keep his steady.

4. The surgeon having dipt his needle in oil, he takes it as he would a writing pen, he rests his little finger on the bone of the cheek, and he pierces the white part of the eye, in the middle betwixt the margin of the cornea, and the angle formed by the eyelids, the patient's eye being directed straight forwards. The needle should pierce the sclerotica in a direction perpendicular to the convexity of the surface, or, in other words, pointing to the centre of the eye.

5. The

5. The needle is now to be somewhat changed in its direction, and carried horizontally until the point appears behind the pupil, for it is to be observed that, although the opacity of the lens is considerable, yet the needle is seen through it, or when it is immersed in its substance. The flat surface of the point ought to be towards the iris, as the sharp edge might cut the iris.

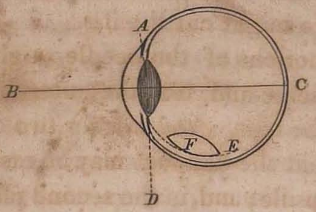
6. The first motions of the needle ought to be calculated to pierce and tear the anterior part of the capsule of the lens. And this for two reasons; first, in order that the cataract may be easily separated from its capsule; and, in the second place, that this anterior portion of the capsule may be broken and shrink, for otherwise it may hang opaque in the pupil, forming what is called the membraneous cataract.

7. Supposing that on first touching the capsule of the lens a white fluid escapes, and makes the aqueous humour turbid, we are not on this account to despair of success; for this milky and dissolved state of the cataract promises a quick absorption and restoration of vision. It is our business in this case to tear the anterior half of the capsule as widely as we may, without hurting the iris, and to plunge the needle repeatedly into the substance of the cataract: the operation is then complete; for what seems so unpropitious proves often to be the happiest thing that can happen.

8. Having torn the capsule, the surgeon withdraws the needle a little, and puts it over the cataract, or pierces the cataract high on its disk.

Now

Now the point of the needle is to be depressed, by raising the handle of the instrument; but at the same time that the point of the needle is depressed, (carrying the cataract with it) it must be moved backward.



For example A, being the lens in its natural situation, to remove it from the axis of the eye, or course of the rays of light B, C, it is not to be pressed directly downward in the line D, but in the circular line E, which answers to the concavity of the coats, and by this movement it will be carried down, and lodged at F.

9. When by raising the handle of the needle, the operator has carried the opaque cataract thus below the level of the pupil, and the pupil is clear, the operation is not done, for in all probability the cataract has not escaped from its capsule, and, on withdrawing the needle, it will rise again. He therefore would have to blame himself, if, having withdrawn the needle from the eye, he saw the cataract again forced up, and take its place behind the pupil, for the operation would be still

to do. When, perhaps after repeated efforts, he has sunk the cataract out of sight, he must cautiously withdraw the needle from its hold upon the cataract, but not altogether from the eye; then, if the cataract does not appear in the pupil, the needle is to be slowly withdrawn altogether.

The fact is, that when the needle has carried down the cataract and it rises again, the cataract is not yet unseated from its capsule, and instead of being separated from the vitreous humour that body has revolved with it; by the elasticity of its membrane the vitreous humor will resume its former relation, and of course carry up the cataract, so as again to present it in the axis of the eye. But the cataract may have been separated from its connexions to the fore part of the vitreous humour, and yet rise in a partial manner, on withdrawing the needle; this is, because it has not been so forced into the vitreous humour, as to break on its capsule, and make a lodgment for itself; the elasticity of the vitreous humour throws it out again. It is incorrect to say, that the cataract has been buoyed up, since it is specifically heavier than the vitreous humour.

There is a possibility that the cataract may escape from under the pressure of the needle, and pass through the pupil, into the anterior chamber of the aqueous humour. If the whole or part of the cataract escape thus, we ought to let it remain; it will dissolve in the aqueous humour, and be finally absorbed. The cataract may start backwards, too, so as to be deeply immersed in the

vitreous

vitreous humour. I have seen it faintly shining half an inch behind the pupil. I fancy this is not a frequent accident: if it should happen, we are to do no violence in endeavouring to remove it, as we are assured it will dissolve, since it must, in this case, be freed of its capsule.

10. It is a more difficult thing to fulfil the intention of the operation, when the cataract is soft or cheesy, for when the needle is pressed upon the cataract, it passes through it without dislodging it from its place, nor does the matter flow out from the capsule.

In this case, the anterior part of the capsule is to be broken, by pushing the couching needle through the pupil; and then the cataract is to be cut in pieces, and portions of it pushed through the pupil into the anterior chamber of the aqueous humour, where in due time they will dissolve.

11. If there be an adhesion of the cataract to the iris, we shall discover this by the irregular figure which the pupil assumes upon the variations of light, admitted into the eye. During operation, if the depression of the cataract should disorder the regular circle of the pupil, it is owing to an adhesion; and we must endeavour to separate the cataract from the iris, by the edge of the needle, before we attempt finally to depress the cataract.

12. If after a few days the eyelids are opened, and there appear any fragments of the cataract, they are again to be depressed, or pushed before the pupil by the needle; but this is not to be done until the inflammation and irritability, the con-

consequence of the first operation, have entirely subsided.

13. The remains of opacity behind the pupil may be what is termed the membraneous cataract. To tear away these shreds, and to push them below the level of the pupil, or through the pupil into the anterior chamber of the aqueous humour, a needle should be used so curved near the point, that by merely rolling the needle, betwixt the finger and thumb, the point of the needle may be moved pretty extensively. With such a needle the operation may be done with less violence, and a smarter motion may be given to the point of it, than where, in order to give motion to the point of the needle, we have to raise the handle.

14. Any portion of the cataract, or any shreds of the cataract, or its capsule, which are accidentally pushed into the anterior chamber of the aqueous humour, are to be allowed to remain there, for they will be dissolved, and carried away by absorption.

15. The secondary cataract is the opacity of the remaining capsule, which is not carried down with the opaque lens, but remains in its situation. The secondary cataract may be perfect or partial. It may be said to be perfect when the lens has escaped from the back part of the capsule, and has been immersed in the vitreous humour, without the anterior half of the capsule being torn from its connexions to the ciliary process, or rent in any way. This is more apt to take place, than we at first would imagine likely, from the greater tenuity of

of that part of the capsule which is towards the vitreous humour, than the anterior portion of it. The imperfect, or partial secondary cataract, is the remaining shreds of the anterior part of the capsule. It is an opinion, that only the anterior part of the capsule is liable to become opaque, and I think this is very likely; there is a foundation in anatomy for supposing that the anterior and posterior part of the capsule of the lens are of a different nature. It is this conviction, that the fore part of the capsule is most frequently opaque, and that it is the most liable to be so after the operation, that induces us to be careful to pierce, and break down this fore part, before couching the opaque lens.

If this has been done, only shreds of opaque membrane can be visible in the pupil, after the operation. And if they appear, we ought to let them remain for some time, in the expectation of their wasting, and acquiring transparency again. I have seen, on dissection, an opaque spot on the back of the capsule, and therefore the secondary cataract may be in the posterior segment of the capsule of the lens. But whether the opacity be in the back or fore-part of the capsule, is of little consequence, since it cannot be distinguished in the living eye, (because the vitreous humour forces the back part of the capsule into contact with the iris, after the depression of the lens itself,) and happily it is of little consequence to know what part of the capsule is thus diseased, as

as the knowledge would make no variation in the practice.

16. In operating for the membraneous or secondary cataract, the intention with which we use the needle may be somewhat varied. We first endeavour to tear down the opaque membrane, and to place it under the level of the pupil, or we may attempt to gather the shreds of the membrane together, to loosen them from their natural attachment, and to push them through the pupil, into the anterior chamber of the aqueous humour, where they will be dissolved and absorbed. We ought not to be too persevering in our attempts to clear the pupil of the membraneous cataract at once; on the contrary, we should be careful to do little injury, so that we may avoid raising inflammation. We may repeat the attempt after a time. The needle should be very fine, for these repeated operations.

OF THE EXTRACTION OF THE CATARACT.

THE extraction of the cataract I allow to be a more formidable operation than couching; but when it is well done, it is more uniformly successful. I do not know that it is more difficult to perform extraction, than it is to perform couching; but the blunders in this operation are at once apparent, while in couching the errors are concealed; and even the initiated cannot precisely say, from the motion of the hand, whether the operator be, with delicacy and niceness of intention, remov-

ing

ing the opacity from the pupil, or making unmeaning, and, consequently, unsuccessful motions of the needle.

Freedom from tumefaction and inflammation of the eyelids, and of all tendency to ulceration in their edges, or to opacity in the cornea, is more essentially necessary, previous to performing the operation of extraction, than of couching.

Extraction, let me say, is a bad term, as it indicates that the intention of the operation is to make an incision, and to pull out the opaque body. This idea is as dangerous as it is incorrect. The principle on which the operation is done, is simply this. The coats of the eye are tense over the contained humours. Over the coats of the eye are expanded the tendons of the muscles, while the eyelids have in them the fibres of the orbicularis muscle. The moment that the eye is wounded therefore the humour escapes at that part. If an accidental wound be made on the white of the eye, the vitreous humour escapes in part. If the cornea be wounded, the aqueous humour escapes. Yet although the cornea be punctured, and the water escape, it does not fall flaccid. But the iris and the lens are pushed forward by the tension of the coats on the vitreous humour, and they take the place of the aqueous humour. Should the cornea not be punctured merely, but cut with so wide a wound, as to allow the lens to pass, the pressure on the vitreous humour by the coats and muscles of the eye will be so great,

that the lens will be thrown through the pupil, and escape by the wound.

The operation to be performed, therefore, is not to extract the cataract, as we speak of extracting the stone from the bladder; but only to make such an opening in the cornea as to allow the cataract to be forced out by the tension of the coats of the eye, which is continual; or by the action of the muscles of the eye. The necessity of attending to this principle during the operation I hope will be presently evident.

INSTRUMENTS.

If the operation is successfully done, no other instrument need be used, but a knife, of a form somewhat peculiar, and adapted to make the proper incision of the cornea. The knife should be of the shape seen in the succeeding marginal plate, p. 59. The point must be very sharp, the back straight, not sharp, and yet not thick; the curved edge very sharp, and the middle of the knife the thickeſt and strongest part of it; in the first place, that the knife may have strength to be pushed through the cornea, and in the next place, that it may effectually fill up the wound as it is pushed forward. The broadest part of the knife must be fully two-thirds of the diameter of the cornea.

The incision is made by passing the point of the knife through the cornea, and across the fore-part of the eye, with one uniform motion; and the point entering on one side the cornea, near its attach-

attachment to the sclerotica, passes through the opposite point, and being still carried forward, the lower edge of the knife cuts freely through the whole lower segment of the cornea, until it disengages itself. But if the breadth of the knife be not sufficient to make its way out, when thus uniformly pushed onward, the edge requires to be pressed down; an incision larger than the knife can fill up is consequently made, the aqueous humour escapes, and the iris is pushed forward on the edge of the knife.

To suspend the eyelid, and in some degree to fix the eye, Pelier's wire speculum is the best instrument in the hands of the assistant. Let it be covered with crape to prevent it slipping, which it is apt to do when accidently moistened in any of the operations on the eye. The assistant ought only to steady the head, and lift the upper eyelid: the pressure to fix the eye must be made by the tips of the surgeon's fingers at the same time that he holds down the lower eyelid.

A gold needle is among the apparatus of the oculist. The use of this is to break or cut the capsule, when after cutting the cornea, that membrane strongly resists the effort of the muscles, to protrude the lens. The point should rather be rough than sharp; whether it be made of gold or of any other metal, is of little consequence.

Forceps too are necessary, and they must be of such a form and niceness, that we may introduce them under the flap of the cornea, and seize any shred

shred of opaque membrane that may present in the pupil.

For the same purpose, and to extract any broken piece of the cataract that is detained, a very delicate hook is to be provided.

The cornea scissars, or a very diminutive probe-pointed knife, are necessary to increase the incision of the cornea, if, as it sometimes happens, the first entry of the knife has not made the incision sufficiently large. A fine probe will be found convenient to replace the prolapsed iris, when it shall have fallen out from the incision.

OPERATION.

The patient is seated on a low chair; the surgeon is seated opposite to him; the light must be steady, and without glare. A cloth is put over the other eye. The surgeon turns the patient's head until the light falls a little obliquely on the eye to be operated upon; the depth of the pupil, and its nearness to the cataract, is then distinctly seen.

1. The assistant standing behind the patient, brings his breast so as to support the back of the head; puts his left hand under the chin, and with the right taking the speculum of Pelier, he raises the upper eyelid by pressing in the integuments of the eyelid, betwixt the eyeball and the margin of the orbit.

2. The surgeon, with the tips of his fingers, presses the lower eyelid against the eyeball, so as to fix it; the margin of the eyelid is at the same time carried down, so that the cornea stands promi-

prominent. The other hand holds the knife. He rests the elbow on the knee, the little finger on the cheek-bone.

3. When the eye is steady, the point of the knife is made to pierce the cornea, within half a line of the sclerotica, and on the outside, and a little above the middle of the cornea, the flat side of the knife is towards the eye, its straight back upwards. The knife is now carried in a direction towards the nose, and at the same time downwards. The nicety of this part of the operation is to carry the knife uniformly forward, to press in that degree which will keep the eye steady, and yet so to manage the pressure, that the aqueous humour does not escape by the side of the knife.

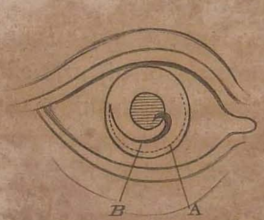
4. The point of the knife is made to pass over the lower half of the pupil, and enter the opposite side of the cornea, at the same distance from the sclerotic coat, as where the point first entered. Now, being carried uniformly forward, the lower edge of the knife will cut the lower segment of the cornea, at the distance of half a line from its connexion with the sclerotica.

The

The knife is here represented, passed, not directly across the eye, but entering near the margin of the cornea, a little further up than usual, and the point coming out a little lower.

The intention of this is to prevent the eye from turning towards the nose during the operation; which it is very apt to do, when the knife is pushed directly from without inward. Although in pushing the knife, in this direction, the eyeball should be turned as much downward, as in the other way it would be inward, yet when the eye is turned downward, we can better proceed with the operation, or more easily turn the eye to the proper direction.

When the eyeball moves before the knife, we must suspend, as it were, the progress of the knife, but not in the slightest degree withdraw it; we wait a little for the ceasing of the spasm, and then with the knife bring back the eye to its original position. Often, I may say, the oculist, distracted by this simple accident, brings out the point of the knife too soon, and instead of making a semicircular incision of the cornea near its margin, makes a cut terminating nearly in the middle of the cornea, thus:



A. The

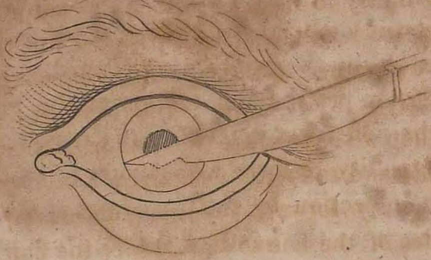
A. The proper course of the incision, marked by a dotted line. B. The course which the knife has taken in cases where I have seen the operator embarrassed by the eye turning inward.

5. It is to prevent this motion of the pupil towards the nose, that practitioners have exerted all their ingenuity to form a speculum to fix the eye. The first objection to the use of the speculum is, that it engages the hand of the surgeon, when he should have his finger free, to press upon the surface of the cornea; and secondly, that the speculum operating by pressure on the eye is apt to force the aqueous humour out, before the incision is completed.

6. Some oculists have recommended, that the capsule of the lens should be punctured before the incision of the cornea be completed, *viz.* as the knife is carried through the anterior chamber of the aqueous humour, they depress the point into the pupil, to pierce the capsule. But this is a practice not to be imitated, as the advantage of it bears no proportion to the danger. The consequence of this manœuvre will be, that the aqueous humour will escape; then the iris will press forward on the edge of the knife, and the incision cannot be completed with the knife.

7. If by any accident the aqueous humour should escape, and the margin of the iris should fall before the edge of the knife, in this manner, we cannot then carry forward the knife.

This



This accident requires calmness. We know how it has happened, and this knowledge teaches us to remedy it. A little of the aqueous humour has escaped, and the iris is pressed forwards: we must restore the equilibrium then, by pressing gently on the cornea. This throws back the margin of the iris behind the edge of the knife, and again we can carry the knife straight forward. *

8. But if the aqueous humour has escaped in such a quantity that the iris has come in contact with the cornea, and lies before the edge of the knife, we cannot finish the section of the cornea with the knife. The point of the knife must be withdrawn a little, and brought before the edge of the iris, and made to pierce the cornea lower down, than would be necessary to make an incision of due extent. By this change of the direction of the

* Baron Wenzel and Mr. Ware give the direction to rub the cornea, as if there was a sympathy betwixt the cornea and iris; but as I have not been able to ascertain that any connexion subsists betwixt the rubbing of the one and the contraction of the other, I have given this intelligible reason for *pressing* the cornea.

the knife, we have made a section of the cornea, without injury to the iris, but it is not of sufficient size to let the cataract pass, we must therefore have recourse to the scissars, or the bistory to enlarge it.

9. When we have made the section of the cornea too small, and the lens or cataract does not come spontaneously forward, we must insinuate one of the blades of the fine scissars under the flap of the cornea, and enlarge the incision.

10. I shall suppose that the section of the cornea has been duly made, and the cataract does not immediately follow. Some oculists have recommended that we introduce a curette into the pupil, and enlarge it. This is an ignorant way of dilating the pupil. We ought simply to shut the eyelids, and cover the eye with the hand, so as to relieve the eye from excitement, and by excluding the light the pupil will be dilated, and ten to one but the cataract will be seen coming from under the eyelids, on lifting up the flap of the cornea.—If the cataract be still retained, then it is not the contraction of the pupil which prevents its discharge, but a particular strength in the capsule. And now the gold needle, or some such instrument, must be passed under the flap of the cornea, and into the pupil, to break or puncture the capsule, when the cataract will be discharged.

10. The Baron Wenzel and other oculists who have gained dexterity by practice, without ascertaining the principle, have asserted that " the incision of the cornea is not the most difficult part of

of the operation, and that it afterwards requires much dexterity as well as judgment successfully to *extract* the cataract." All that I know of the structure of the eye, and what I have seen of these operations, and the difficulties I have myself experienced, contradict this opinion. The successful incision of the cornea is the operation, and all the untoward circumstances that may trouble the operator have their source in the imperfection of the section of the cornea. If there is adhesion to the iris, it ought to have been ascertained if the pupil is too much contracted; it is equally a fault not to have ascertained this previous to the operation being undertaken.

As soon as the knife has cut itself out, the upper eyelid should be allowed to fall; for the uniform support of the eyelid prevents the cataract from being thrown out too quickly, or the vitreous humour from following it, if it should escape before the eyelid can be closed. If upon raising the eyelid the lens does not make its appearance, the capsule is to be punctured, and the eyelids again closed to allow the pupil to dilate. If it does not now come forward, the small probe is to be introduced under the flap of the cornea, to examine if the incision be large enough; for, from the thickness of the cornea and the oblique direction of the knife, the incision of the cornea may seem to be of sufficient length on the surface of the cornea, when the knife has not penetrated to the inner surface nearly to the same extent: if the incision should prove too small, it must be a little enlarged

 with

with the scissars, as I have said. If the cataract does not now come out spontaneously when the incision is evidently sufficient, and when the capsule is punctured, we are forced to press the eyeball.

12. We ought not to press the eyeball if it can be avoided; for there being a difficulty in forcing the cataract through the pupil, when that difficulty is overcome the vitreous humour is apt to follow the cataract; and often it will happen that the vitreous humour will escape without the lens being discharged. By this pressure the lens is not carried through the pupil, but only the edge of it is protruded, and the vitreous humour escapes under it, while the firmer cataract is retained. *

13. When the iris is accidentally cut by the edge of the knife, no pressure must be made on the eyeball, or the vitreous humour will escape while the cataract is retained. When the pupil is of its natural form, and the iris entire, the cataract presents behind the pupil, and no part of the vitreous humour escapes before it is protruded,

* Thus we find the Baron de Wenzel describing a thing which should never be seen:—"The cataract did not give way to the gentle pressure that is usually found sufficient to dislodge it. Its upper edge repeatedly advanced into the pupil, and sometimes almost came through it," &c. Every time the chrystalline advanced, a small bladder was perceived on its posterior and inferior edge, strongly adherent to it, and formed by the hyaloid membrane, &c. To press the eyeball in such a state of the lens and the bladder which is here described, is out of all rule. The bladder is simply the vitreous humour pushing forth under the lens or cataract, which has turned its edge forward instead of being carried bodily through the pupil.

 but

but when the iris is cut, the vitreous humour being softer, is carried through the slit of that membrane, and the lens is only turned a little, but not unfixed, and pressure may force out a great deal of the vitreous humour before the lens will come. By inattention to this consequence of the iris being cut, I have seen a great part of the vitreous humour lost. If the iris be cut, we should then indeed extract the cataract by piercing it with the crooked needle; unavoidably, I am afraid, some part of the vitreous humour will escape.

14. When there is a detention of the cataract by adhesion, it is recommended that we should carry the golden needle all round the cataract, and in different directions, to separate these adhesions. This appears to me as absurd as dangerous. The adhesion is betwixt the capsule and the ciliary processes and iris; we have then only to pierce the anterior part of the capsule, to open it freely if it be very tough, and then the cataract is discharged, for there is no adhesion betwixt the capsule and the cataract*. If, after the discharge of

* "After the cornea and capsule had been properly divided, my father found that the cataract did not come through the wound on his making the usual pressure. He was therefore obliged to introduce the needle and carry it in different directions round the chrystalline, in order to destroy the adhesions it had formed to the posterior parts of the iris. This part of the operation took up at least fifteen minutes." This is the recommendation of the Baron de Wenzel, his son, and the commentator, Mr. Ware.

On

of the opaque chrystalline or cataract, opaque membranes fill the pupil, we may be tempted to extract them; but if the anterior part of the capsule of the lens be ruptured, though the shreds of that membrane may be visible, (owing to their opacity,) yet I conceive we have nothing farther to do but to close the eye. By holding the patient's eye thus exposed to the light, and introducing instruments under the cornea, we excite spasm in the muscles, and as the membranes we are tearing away are connected with the vitreous humour, it is scarcely possible in this attempt to avoid losing much of that humour.

If the anterior part of the capsule be opaque, the lens having burst through it, it will, I imagine, be better to let it take the chance of wasting in the aqueous humour, than by tearing it away to endanger the entire loss of the organ, in consequence of the discharge of the vitreous humour.

15. When the cataract is discharged entire, we ought to have little further anxiety, I imagine, than to see that the iris does not hang relaxed into

---

On this account we first ask ourselves, why was the capsule punctured, but that it might burst freely open, and allow the cataract to escape; and if the cataract did not escape, was it not owing either to a bad incision, or if that is not likely in so dexterous hands, to the strength and toughness of the capsule; why therefore was the intention of the operation changed; why, because the lens would not come forth, and drag the capsule with it? To have cut the capsule freely open, and to have dilated the pupil, is what should have occurred to us as the best practice.

 the

the incision of the cornea; as light contracts the pupil, so will opening the eyelids make the relaxed iris draw up; but if it be at all engaged betwixt the edges of the cornea, it will require to be replaced by insinuating the small probe into the incision.

16. When the operation is finished, we must see that the edges of the incision come accurately together, then the eyelids should be closed, and some plies of wet lint hung before the eye; the clothes must not press much upon the eyelids. Before putting the patient to bed, we must see that the margins of the eyelids are properly together, and that none of the eyelashes are turned in upon the eye. The eyelids should be looked to the next morning, and, if necessary, bathed and cleaned of any secretion: the eye should be examined carefully on the third day, but the eyelids instantly replaced, and the patient enjoined repose and darkness for ten days.

17. It is, in my opinion, entirely out of the question, to perform the operation of extracting the cataract a *second time*. If there occurs any necessity for removing a remaining opacity of the pupil, after the chrystalline humour has been discharged, and the incision of the cornea healed, it must be done by the needle, as practised in couching.

There is an operation for cataract at present performed by some oculists, which I think cannot bear comparison with the operations I have described. This method requires more than usual dexterity; and it is a tedious and difficult operation;

tion; and it is necessary to repeat it often to ensure success.

This operation consists in passing a small cutting needle or knife behind the iris, and slicing off portions of the cataract which are to be conveyed through the pupil, and placed in the anterior chamber of the aqueous humour.

It must be evident to my reader, that this, to say the least, is a difficult operation: a difficult operation is a tedious one; and a long continued interference with the eye almost of necessity produces great and destructive inflammation. In taking the recommendation of oculists, we must not try them by contrasting them with one another; I mean as to their success: they are all successful; and there are no difficulties which their dexterity is not equal to. We must consider any proposed operation according to its proper merits, paying no regard to the dexterity with which, in the first instance, the difficulties are said to be removed.

Knowing how moveable the lens is, how easy to be displaced, we may foresee the difficulty of diminishing the bulk of the cataract by cutting off thin portions of it, and pushing these fragments into the anterior chamber, and afterwards by successive operation dividing the more solid nucleus of the cataract.

It requires a knowledge of the pathology of the eye to understand what is meant by all these novelties, and how the operator at last succeeds: it amounts to this, already so well understood, that by breaking the capsule and the surface of the

 cataract,

cataract, and by admitting the aqueous humor to act upon the cataract, it gradually, but somewhat tediously, wastes, and is dissolved.

Oculists have of late been much too adventurous in search of novelties, and they have assumed merit for the invention of operations, for which they ought to suffer reprimand, if there was any more fit tribunal than public opinion, which though easily moved for a time, will, I am convinced, settle into a conviction of the superiority of the old operations for cataract.

OPERATION FOR THE CONGENITAL CATARACT.

The cataract which appears in the eyes of children at birth, has some peculiarities distinguishing it from the cases already described; and the early age makes it necessary to institute an operation differing from the methods I have described.

It appears from the observations of the late Mr. Saunders, that this is for the most part a membraneous cataract; that the opacity having taken place, the substance of the lens is very generally absorbed, leaving the posterior and anterior part of the capsule collapsed into a strong and opaque membrane.

This important fact, furnished by Mr. Saunders's extensive experience, at once determines the impropriety of attempting the extraction of the cataract in children. Besides, infants are with difficulty restrained in their posture, and their eyes have a peculiar unsteadiness, which makes the delicate operation of extraction impossible.

 Mr.

Mr. Saunders's success in operating on children was very great. He used the needle, and not for the purpose of depressing the cataract, but of partially destroying the capsule and letting in the aqueous humour upon its texture, so as to promote absorption. His merit in this operation, as it appears to me, was taking full advantage of a fact previously well ascertained, viz. that the cataract would dissolve and be absorbed if it were partially broken and submitted to the operation of the aqueous humour. With the same happy talent of combination, he took advantage of the known effect of belladonna to occasion the dilatation of the pupil, and consequently to prevent the adhesion of the iris to the cataract, during the inflammation which follows upon the operation. But it is evident, notwithstanding the lavish praise bestowed upon the use of the belladonna previous to the operation, that it is of no service; but on the contrary, the great dilatation of the pupil occasioned by the use of it, endangers the falling forward of the lens, and a destructive inflammation may be the consequence of that accident.

THE ANTERIOR OPERATION.—After dilating the pupil by the use of the belladonna, and securing the child, (which every surgeon will do best after his own method,) Mr. Saunders pierced the cornea near its connection with the sclerotica with a small flat needle having a cutting edge. He carried the needle near to the iris and parallel to it, till the point came opposite to the center of the cataract. "He proceeds with a gentle lateral

ral motion, working with the point and shoulders of the needle only on the surface and center of the capsule, in a circumference which does not exceed the natural size of the pupil. His object is permanently to destroy the central portion of the capsule; merely to pierce it, would not answer his intention, because the adhesive process would speedily close the wound. Having acted upon the anterior laminæ of the capsule to the extent which he wishes, he gently sinks the needle into the body of the lens, and moderately opens its texture."

These are the expressions of Mr. Saunders's editor, and of a very partial friend, Dr. Farr. The objection which offers itself to this account of the operation is, that it is at variance with the description of the patient's situation, which renders an operation so curiously nice as this, nearly impossible.

THE POSTERIOR OPERATION. — Mr. Saunders performed an operation by entering the needle behind the iris, carrying its point to the center of the pupil, and in effect doing the same operation on the membrane and lens; viz. opening them gently and admitting the aqueous humour to influence and assist the absorption. This was his first operation; and he appears to have changed it to the anterior operation, only because he thought perforating the cornea would produce less inflammation. But the danger of inflammation in this operation does not depend on the manner of piercing the eye; it arises in the highest degree from the displacement

of

of the nucleus of the cataract and the motion of the iris upon it. Let me not forget to observe, however, that this observation we also draw from Mr. Saunders. If the inflammation be prone to rise, as a consequence of the displacement of the lens, what is it that makes that accident so apt to happen here? Undoubtedly it is the use of the belladonna and the dilatation of the pupil. It is also apparent that the indication can be fulfilled by the operation from behind; that to effect this the belladonna is not necessary; that the needle being introduced in the usual place, and the capsule abraded and torn, the aqueous humour will be admitted to operate; the substance of the lens (if it be entire) may be also pierced and opened without the previous dilatation of the pupil. After the operation the belladonna will be found to be of essential consequence to dilate the pupil, and to prevent the accretion of the iris to the cataract.

The essential improvement in the operation for cataract in infants amounts to this, that extraction is found to be impossible; that depression is not necessary; that the use of a small needle to break the capsule very gently will be found sufficient to dispel the opacity; that the belladonna is to be used to prevent the accretion of the pupil; and finally, that the operator is not to attempt much at one operation, but to repeat it at the distance of a fortnight or three weeks.

I put a high value on the practical information to be gathered from Mr. Saunders's works: two things

things have tended to obscure his reputation, his attempt at concealment, which prevented him from being sufficiently honoured while he lived, and the extravagant eulogy of his friends, which leads to too high an expectation, and consequently to disappointment in the perusal of his works.

OF INFLAMMATION OF THE EYE, AND OF THE TREATMENT AFTER OPERATION.

The eye is necessarily of very delicate structure, and exposed more than any similar part of our frame. The natural delicacy and transparency of its membranes are preserved in a manner truly admirable. The tears which wash its surface, we must have observed, are acrid and stimulating, and when they run over the cheek, inflame and excoriate the surface. But the delicate surface of the eye and eyelids are accommodated to the presence of this fluid; and the advantage resulting from this is, that the surface is not disordered or irritated by any lesser degree of stimulus, and consequently it bears the variations of the atmospbere, and the excitements it is necessarily exposed to.

Yet when we consider the exposure of the surface of the eye, and the delicacy and vascularity of its membranes, we cannot wonder that it should be often inflamed, and often suffer from those derangements of the constitution which are not to be remarked but by some such local affection as chronic inflammation of the eye.

I see

I see chiefly these distinctions in the inflammation of the eye: 1. An acute inflammation, with evident symptoms of constitutional derangement, marked by nausea and a furred tongue, or accompanied with inflammation of the mucous membrane of the nose, and sinuses, and symptoms of inflammatory fever. 2. A lower degree of inflammation, chronic, and resisting local remedies, which results from some derangement of the system, and for the most part attended with deranged function of the bowels. 3. Lastly, an inflammation resembling the others in appearance, but the effect of local debility in the eye, and characterised by a relaxed state of the vessels, and a fullness of the membranes, the consequence of a preceding violent inflammation.

1. In the first example, while the inflammatory action is to be subdued, all that may excite, is to be removed in the first stage. Every surgeon of good practice forewarns us to notice well that change which takes place, when, instead of the violent throbbing, the acute pain, and hot watery discharge, there is only a swelling and turgessence in the membranes, with a diminished irritability, the eyelids more flaccid, the fieriness being gone, though the redness remain; now the evacuations, the soothing and emollient applications, which were necessary at first, will only continue the symptoms, and tend to fix the complaint, while cold stimulating and astringent applications are to be employed.

The

The mere consequences of violent ophthalmia, and which are not to be considered as fixed or peculiar diseases, are the *phlyctenæ*, which are small vesicles formed on the surface of the eye; the *chemosis*, which is the swelling and projection of the conjunctiva; the over distention and muddiness of the cornea; the *puriform discharge* from the eyelids; the *hypoion*, the *ungula*, the *unguis*, which are different names for the same disease, viz. a deposition of coagulable lymph or of pus, in the anterior chamber of the aqueous humour; all these, being sure consequences of the high inflammation, are to be prevented or cured by removing the inflammation.

The diseases which require operation are for the most part the consequences of the continued chronic ophthalmia, and which from the slowness of their formation do gradually acquire a kind of constitutional permanency which requires operation.

The *nebula*, or cloudiness from an opacity of the surface of the cornea; the *albugo*, an opaque deposit in the substance of the cornea; the ulcer of the cornea, and the *leucoma*, which is the cicatrix of that ulcer; the *pterygion* and *pannus*, different degrees of the relaxation and thickening of the conjunction, which appears as a new-formed membrane advancing on the cornea; these are for the most part the consequences of chronic ophthalmia.

When any new membrane seems to be formed on the eye, any pustule, ulcer, or opacity, accom-

companied with clusters of turgid veins, or a general relaxation and fulness of the vessels,— before taking the knife to these, we ought to examine if any accidental cause has existed which is now happily removed; or whether or not by the foulness of the tongue, the want of appetite, the languor and sickness, the occasional rheumatism in the face and head, or head-ache, or any such slight affections, there exists derangement in the system, or debility and consequent accumulation in the stomach and bowels. We must examine well whether the local disease partakes of the character of scrophula or syphilis.—The influence of these causes ought, if possible, to be removed before operating on the eye.

Previous to an operation the patient should take a smart purge; from the immediate debility proceeding from this he ought, however, to be recovered. The immediate effect of a severe or protracted operation on the eye will often be a nervousness and sickness, or coldness, shivering, and head-ache: this state, an opiate with an aromatic will remove; and as it will often happen, that the irritability of the stomach will prevent the medicine from being retained, if the opiate be given in the form of clyster to the quantity of what would be a double dose if taken by the mouth, it will cause the commotion and sympathy of the frame with this most irritable organ to subside.

If blood flows from the eye in consequence of the operation, it is to be promoted by bathing the

eye

eye with tepid water. After all operations on the eye, the patient must be condemned to darkness, and low diet; a wet rag be put on the eye; the bowels must be kept open. He must not indulge in bed, nor lie with his head low, nor have his head and eye loaded with bandages and dressing. Opiates should be held in reserve as long as possible. That inflammation which proceeds from the stimulus of the knife, should be treated with emolients, and the eyelids washed with tepid water. The astringent collyria should be reserved for that stage when there remains not the smart action of vessels, and the acute sensibility, but, on the contrary, a relaxed state of the parts only. There is a niceness of observation necessary, to be able to say when the operation has ceased to produce its effect, when it may be repeated, or when a caustic may be applied to assist in the cure, supposing an excrescence or tumour has been cut off. Even after this effect of the mere irritation of the knife might be expected to have subsided, there will often come on symptoms of general disorder, head-ache, and increase of heat, with restlessness and watching. But the tongue, the bitter taste of the mouth, and nausea, point out to us the necessity of moving the bowels; after which, by quietness and low diet, they will subside.

This lowness of diet is not to be the universal rule; but observing when there is a tendency to high action, or irritability of weakness present, we must half-starve some, and give more generous diet

diet to others. Above all, we must guard against the complaint being fostered and supported by confinement and bad air, low diet and despondence, for this reduces the system to that state which, though not actually disease, is particularly unfavourable to the cure of surgical diseases.

OF PUNCTURING TO EVACUATE THE AQUEOUS HUMOR.

By much the most curious and useful observation made of late years on the diseases of the eye is that of an opacity, resulting from the mere distention of the cornea. We owe this to Mr. Wardrop. During a violent inflammation of the eye, we see the cornea become opaque; the pupil is obscured; the sight is lost; and we despair of the recovery of the vision. But this obscurity of vision is not the consequence of inflammation of the cornea, nor of deposition of lymph or pus in it; it is the effect of an unnatural relation of the lamina of the cornea, which no longer permits the light to be transmitted: it is an opacity which proceeds directly from the distention of the coats of the eye. When the cornea of the eye is punctured, and the aqueous humour evacuated, the pain is relieved, and the opacity is suddenly removed. The objection to this operation may be thus stated. The aqueous humour we know to be secreted in a few fours, most probably in a much shorter time; will not the secretion of the fluid so quickly cause the return of the tension upon the coats, so as to defeat the purpose of the operation; and is not the breach of continuity of the coats

of

of the eye, and the bringing the iris into contact with the wounded cornea, evils counterbalancing the good to be expected from the operation? But the circumstances of practice as I have noticed them, incline me to the opinion of Mr. Wardrop. I have seen a patient with inflamed eye and ulcer of the cornea, with fever and throbbing temples, and tightness over the forehead suddenly relieved, not only from the pain, but from the high inflammation of the coats, by the ulcer penetrating to the chamber, and evacuating the aqueous humor. I have seen the eye thus spontaneously relieve itself of the violence of inflammation, and recover even without a protrusion of the iris, or adhesion of the iris to the cornea.

When the eyeball is inflamed; when there is a sense of fullness with deep pain in the eyeball, and pain in the back part of the head; and when the cornea assumes a turbid appearance; and when powerful evacuations have failed to afford relief; the puncture of the cornea and the evacuation of the aqueous humour, seems a fair and legitimate means of relieving the surcharged coats of the eye. But it is not an operation which supersedes the other active remedies for subduing inflammation.

Operation.—The eye is to be fixed by means of Pellier's speculum in the hands of the assistant, and the fore and middle fingers of the operator's left hand. The puncture is to be made near the margin of the cornea: it may be made with the point of the extracting knife; taking care that

after

after entering the chamber we raise the edge of the knife to let the water escape: or the operation may be done with a spear-pointed needle, the head of which makes a wound somewhat larger than the shaft fills up, and which, therefore, on entering the chamber, admits the flow of the aqueous humour.

RELAXATION OF THE EYELID.

THERE may be a difficulty of raising the eyelid, from an irregular motion and spasm of the orbicularis palpebrarum *. There may be a difficulty of raising the eyelid, from a loss of power in the levator palpebræ superioris. There may be a relaxation of the upper eyelid, in consequence of inflammation long since subsided; a fullness of the cellular membrane, which prevents the action of the levator muscle. In this last case a portion of it may be cut off, so as to relieve the eyelid, which otherwise hangs over the cornea, and obscures vision.

EVERSION OF THE EYELIDS. *(Ectropion.)*

THE conjunctiva having been inflamed, there sometimes remains a tumefaction in the conjunctiva, with a weak chronic inflammation. The edge of the eyelid is turned outward, and there is a semilunar, pale, fleshy tumour betwixt it and the eyeball. The cornea sometimes appears sunk within a circular tumour. The eyelids no longer

* An irregular nervous affection producing it, as in hysteria.

 wipe

wipe the dust from the cornea; they are removed from it; the eye is hot, and the tears fall over the cheek, and there occur of course frequent attacks of more violent inflammation, and in the end an opacity or ulceration of the cornea takes place. In slight cases the tumours are only to be scarified, or the surface, (if it shall have granulated) may be destroyed with the lunar caustic. The object in both these ways is to produce a cicatrization and consequent contraction of the conjunctiva.

When the disease is more confirmed and the semilunar tumour of the conjunctiva considerable, the whole protruding part is to be cut off. To do this, it is seized with the hook or forceps, and with the crooked scissars it is to be cut off. After this a few touches of the knife may still be necessary, and during the cure the end may be further secured, by touching any prominent granulation with the caustic and by the use of astringent washes.

OF THE INVERTED EYELID.

Inversion of the eye is where the margin of the eyelids and consequently the eyelashes are turned inwards upon the eye, proving a continued source of irritation and inflammation.

No spasm or violent action of the muscles of the eyelids will produce this inversion, nor will the paralysis of the same muscles have any tendency to form it. It is one of the many consequences of chronic inflammation, which making, as it were, a per-

a permanent growth of the superficial part of the eyelid, while the conjunctiva remains contracted it follows of course, that the edge of the eyelid is turned in. It is then in all respects the exact reverse of the eversion, and tumour of the conjunctiva. But perhaps this position of the tarsus is not merely the consequence of a fulness of the cellular membrane, or growth of the skin, but of ulcers; the inner surface of the eyelid and tarsus may be contracted by the forming of the cicatrix.

The surgeon has to determine by careful examination, whether or not the inversion be owing to the growth or relaxation of the outward skin and cellular membrane of the eyelid, and if it be, there is this method recommended of removing the evil.

With the finger and thumb a portion of the skin of the eyelid is raised, so as to hold a ply or double of the skin, parallel to the margin of the eyelid. In doing this the surgeon will be able to distinguish betwixt the skin and the muscle, and will of course be careful to avoid catching hold of the orbicularis muscle. The scissars are now applied so that an oval piece of skin, or rather a piece of the form of a myrtle leaf, is cut out. The appearance of the eye is frightful, but first by means of an adhesive plaster, and then by a compress and bandage the skin of the eyebrow is brought down so as to allow the margins of the wound to approach. The cicatrix forming consolidates and gives firmness to the outward skin,

so as to keep the ciliæ from being again inverted upon the eye.

But if this inversion of the eyelid be a consequence of ulcers and contraction of the inner and cartilagenous edge of the eyelid, forming a kind of stricture which prevents the inner edge from rising fully over the eyeball, and which drags in and inverts the margin of the eyelid, then a different operation is performed. Having forcibly turned out the inside of the diseased eyelid, the inner membrane of the eyelid, and the ciliary cartilage are to be cut across by the point of a lancet. If the inversion of the eyelid has arisen from the alleged cause, it will be immediately relieved.

OF TUMOURS OF THE EYELIDS.

There are tumours of the eyelids which the patient is very willing to have taken off, and which should be taken off, because they push in the tunica conjunctiva, and pressing upon the eyeball, during the motions of the eyelid, they cause inflammation. These are small incysted tumours growing in the place of the meibomean glands, and it is natural to suppose that they are the enlarged glands.

But we must observe, that there are tumours of the eyelids which ought not to be cut. These are small tumours with a broad base, and of a dark red colour. Sometimes they have the appearance of a small boil, being white on the most prominent

minent part: yet this is not pus *. On the contrary, the tumour we have to cut out is colourless, only in as much as sometimes by exciting the eye there may be some general inflammation.

These incysted tumours of the eyelids, it is needless to attempt to remove either by local remedies, or by attention to the general remedies; they ought to be cut out; I must add, however, that there is more pain and bleeding than would be imagined to be the consequence of so trifling an operation.

It is necessary to examine whether or not the tumour be so united to the inner membrane of the eyelid as to force us to cut through the eyelid altogether, before we can take away the tumour, if we should operate by making our first incision on the outward skin. If the conjunctiva seems intimately united to the tumour upon our everting the eyelid, we have to proceed thus:

As in all other operations on the eye, the patient is to be firmly seated, and an assistant stands behind him to support the head, which he does by pressing it against his own breast. 1. The assistant must invert the eyelid, by catching the eyelashes and margin of the eyelid with his finger and thumb, and turning his fingers, so

* *Hordeolum.* In this tumour of the eyelid we should do very little, unless it be to move the bowels. When, however, the little swelling advances, this white speck bursts and discharges a little fluid, and then a slough is seen within, which is by and by pushed out, and the sore closes, to promote which, fomentation and poultices are used.

that the fore-finger pushes forth the tumour and everts the eyelid. 2. The surgeon now draws his lancet pointed scalpel across the tumour, so as to divide the tunica conjunctiva in a direction parallel to the edge of the eyelid. 3. Having by scratching a little separated the membrane, so that the tumour is thrust out, he has to push a hook or small tenaculum into it, and then to dissect it away altogether.

But if the conjunctiva be not diseased or very firmly united to the tumour, we had better operate without everting the eyelid, and this is possible without leaving an observable scar on the eyelid.

1. The surgeon fixes the eyelid by pressing the two angles down by the points of the fore and middle fingers, and having stretched the outer skin of the eyelid over the tumour, he draws his knife directly over the tumour and parallel to the edge of the eyelids, consequently separating the fibres of the orbicularis, not cutting them across. 2. Having exposed the outward half of the tumour, he pushes the fine tenaculum round under it, and then dissecting it a little more, he applies the curved scissars, and cuts it off from the tunica conjunctiva.

The orbicularis muscle holds the lips of the wound together, without our assistance, and then it is only required that we bind a cloth wet with cold solution lightly on the eye.

When tumours grow within the socket, they are to be early extirpated, for though they should be of a harmless nature, yet their increase simply, by pushing

pushing the eyeball forward, and stretching the optic nerve, will cause blindness and deformity, while by filling the socket and pressing more and more on the eye, the operation of cutting them out becomes daily more difficult.

OPERATION ON THE ENCANTHIS.

THE Encanthis is a tumour arising from or at least involving the caruncula lacrymalis, it is of a pale red colour, and irregular on its surface; as it increases it draws into its substance the semilunar fold of the conjunctiva and stretches its root along both eyelids. When this tumour is of a darker hue and hard, and has lancing pains in it, and still more when becoming more active and vascular, it bleeds easily or ulcerates, it is becoming cancerous. I should say, it is showing the disposition which was before occult.

Even before the tumour shews this cancerous character there may occur good reasons for cutting it off. When it becomes rooted in the eyelids, and the cancerous disposition has spread, nothing but the extirpation of the whole eye will avail, if even that is effectual. When the tumour is not of a malignant nature, and when it has only produced the lesser evil of a weeping eye, by its pressing the puncta, and caused inflammation of the eye, by preventing the eyelids from meeting, it may be cut out with better hopes of success. We may do it thus:

1. The assistant turns down the lower eyelid with his finger, or with the assistance of a flat and blunt

blunt hook; the surgeon then with a pair of nice forceps, and very sharp knife, dissects off the root which the tumour has shot along the inside of the eyelid. 2. The assistant then turns up the superior eyelid, when the surgeon in the same way dissects off the root of the tumour from this eyelid. 3. Now the body of the tumour is to be pierced with the hook and drawn outward, and if it should appear that the caruncula lacrymalis is natural and distinct from the tumour, then the latter is to be dissected off from the caruncula lacrymalis; but if they shall be incorporated, the whole is to be taken away. 4. The last part of the operation is to dissect up the diseased conjunctiva from the surface of the eyeball.

After the operation, the eye may be fomented until a considerable quantity of blood be lost. When this is done, let the wound be dressed, by placing a small compress of lint upon the integuments, which, with a strap of adhesive plaster, will keep the surfaces in contact.

OPERATION ON THE PTERYGION.

The Pterygion is a pale red film, which stretches generally from the inner angle of the eyelids, across the cornea. It is one of the pure consequences of continued inflammation. When this web covers the whole eye it is called PANNUS. But the terms film and web deceive us, for this is not a new membrane formed on the surface of the eye, but only a congestion in the cellular membrane, under the conjunctiva, which, as it were, loosens it from the sclerotica, at the same time that its vessels

are

are increased in number, and become tortuous. This diseased state of the conjunctiva encroaches in a conical form on the lucid cornea: it is there too of the same nature; the transparent outer lamina of the cornea becoming opaque, and being at the same time loosened in its texture.

OPERATION. 1. The patient being seated with a cloth under his chin, the assistant stands behind him and supports his head, having in one hand a sponge full of tepid water, which from time to time, in the progress of the operation, he pours into the eye, as it becomes obscured by blood. The assistant opens wide the eyelids.

2. The surgeon now with very fine forceps, or with a needle, raises the apex of the pterygion which is on the cornea; he then pushes the knife, used for the extraction of the cataract, under the fold of the membrane which he has raised; he carries the knife forward until the edge shall have cut itself out, and have separated the very apex of the membrane from the cornea.

3. Now holding the membrane up, it is to be dissected a little from the white part of the eye, and lastly the scissars are to be applied (pointing upward or downward), so as to cut across the middle of the membrane, where it is attached to the albuginea.

The eye is now to be washed with tepid water, while the blood flows, and then a light compress of wet linen is to be put on the eye. The surface which has been diseased acquires a peculiar yellow colour; some weeks elapse before it contracts fully, and forms a cicatrix. The treatment after this is only

only such as may be necessary to suppress any appearance of returning inflammation.

That part of the cornea from which the pterygion has been cut off, does not entirely recover its transparency.

OPACITY OF THE CORNEA.

THE practice is to extirpate the tortuous fasciculus of vessels, whose elongation over the cornea caused, or necessarily accompanied, the formation of the opacity, and which we may now suppose, feeds and supports it. These may be cut across with the scarificator, or if the vessels be more distinct and accumulated, a portion of them may be cut away. The fine eye-scissars and a common housewife needle, stuck with its head in a piece of wood, are sufficient apparatus for this end. The head of the patient is supported against the breast of an assistant, and the eyelids held asunder while the eyeball is at the same time pressed that it may be kept steady.

2. The surgeon passes the needle under the fasciculus of vessels, and lifts them from the sclerotia near the margin of the cornea. He then places the scissars under the needle, so as to cut out a considerable portion of the conjunctiva and the congeries of vessels. The eye is to be fomented, that the bleeding may continue from the cut vessels. The opacity of the cornea will often disappear the first or second day after the operation.

The practice in the more permanent opacities of the cornea, viz. the albugo and leucoma is very

vague,

vague, because of the great difficulty of removing them, and the frequent disappointment in the attempt to cure them. All that is to be said, seems to resolve into this—if there be a remaining inflammation or laxity of the vessels of the eye, this is to be removed by local and general means;—if, on the contrary, all inflammation has subsided, and the speck is stationary, we endeavour to excite such an action in the part by stimulants, as may produce eventually some change in the disposition of the part.

Application of Caustic to the Cornea.—Ulcer in the cornea may be a consequence of violent inflammation, or a direct effect of external injury. It has been asserted that the ulcer of the cornea is oftener the cause of the ophthalmia, which accompanies it, than a consequence of the ophthalmia. This teaches us not to trust to general remedies for the removal of the inflammation. The ulcer then is to be touched with the lunar caustic. This of course deadens the very sensible surface of the ulcer, and it being no longer sensible to the acrid stimulus of the tears, the irritation subsides.

The best way of applying the caustic is to have it set in a quill, and put on the stick of a pretty large camel-hair brush; the caustic must be cut down to a small point; a little milk is beside the surgeon, in which he dips the brush. He then opens the eyelids, and at the same time presses them to fix the eyeball, he touches the ulcer with the caustic, and presses it to the bottom of the ulcer, and when he has done this, he brushes the liquified caustic from the eye with a motion of his

brush.

brush. — In a day or two the irritability of the eye returns, for the deadened surface of the ulcer has separated, and the tears again come in contact with the sensible surface, but the pain and intolerance of light is less than before; it is to be touched again with caustic, with a more permanent relief of symptoms. And if things go on successfully on the clearing of the ulcer in successive times, instead of being eaten deep it is shallower, and fills up, and the inflammation subsides. The caustic need not be applied after the irritability of the eye ceases.

OF THE STAPHYLOMA.

The Staphyloma is an opaque conical tumour of the cornea, it is often of a white or pearl colour, sometimes dark or variegated by the accretion of the iris to it. The staphyloma is sometimes a consequence of small-pox, or indeed of any violent inflammation. The Egyptian opthalmia has left many of our soldiers blind with staphyloma.

The opacity of the cornea produces blindness of that eye, but the worst circumstance of the disease is, that although it has no malignity, it is always liable to be aggravated, and to affect the other eye also. The tumour of the cornea projecting from betwixt the eyelids, remains dry, and becomes ulcerated; there is a continued inflammation of the eye thus produced, and from the intimate sympathy which exists betwixt the eyes, the other becomes sore also, and even ulcers form on the cornea of it. When we know this to be a consequence of the

the staphyloma, we cannot hesitate about cutting it off.

The intention of the operation is to evacuate the humours of the eye, that the coats may contract, and be within the margin of the eyelids.

OPERATION.

THE patient is seated as for the extraction of the cataract, and the assistant supports the eyelid in the same manner. The surgeon takes the largest of his knives for the extraction of the cataract, and pushes it through the tumour, in the direction he would cut the cornea in the operation of extraction; but he does not enter the knife so near the margin of the cornea as in that operation. Having made a section of the lower half of the tumour, he takes hold of the flap with the forceps or sharp hook, and completes the circular incision. The tumour being cut off, and the chamber of the aqueous humour largely opened, the humours of the eye are gently squeezed out of the coats, when the eye subsides within the eyelids.

The cornea being the only part cut in this operation, and this being a part neither vascular nor very sensible, the inflammation is some time of commencing. On the fourth day the eyelids are inflamed, and on the seventh or eighth there is pus on the poultices applied to the eye. Scarpa in particular recommends the operation to be performed as I have here described, saying, that very terrible consequences result from including the sclerotic coat

coat in the incision. But I have seen the operation performed by cutting off the whole anterior segment of the eye without any bad consequence; notwithstanding this, the reasoning as well as the facts alleged by Professor Scarpa must sway us, where there is no advantage resulting from a practice opposed to his.

After the operation, a pledget of soft lint soaked in oil, may be applied over the eyelids, and when the inflammation rises, if the fever and pain be great, we must bleed largely, and use a cold application to the forehead. Afterwards, as we wish to produce suppuration on the surface of the membranes, we may foment and apply poultices, rather than repellent cold applications.

PROTRUSION OF THE IRIS.

The protrusion of the iris is marked by these characters. There is a small prominent tumour or speck on the cornea of the colour of the iris. Around its base the cornea is opaque. The pupil is a little removed from the centre, and somewhat changed from its regular form, and the plane of the iris is more oblique than natural; the vessels of the conjunctiva are large and numerous, and the eye is particularly irritable.

This is a kind of hernia of the iris, which is apt to occur after the operation of extracting the cataract, or in consequence of wounds or ulcers of the cornea penetrating to the chamber of the aqueous humour. This is not a relaxation and falling down of the iris, but it is pushed out as an intestine is

in

in hernia, by the contraction of the eyeball, and in the narrow opening of the cornea it is sometimes strangulated too like a hernia. It is impossible to reduce this protrusion when it is the consequence of ulcers of the cornea; for supposing that the iris was separated from the cornea, would not the aqueous humour again be discharged, would not the lens again press forward the iris, so that it would be pushed through the opening of the cornea? The entangling of the iris in the ulcer is not owing to this membrane floating with the current of the aqueous humour, towards the opening; but, as I have described in speaking of the extraction of the cataract, the whole contents of the eye press forward to the breach, and the iris presents first. It has been well observed that this presenting of the iris in the ulcer, saves the eye from total destruction, though it be a painful disease in itself. The practice in this disease is simple. We have to touch it with the lunar caustic; this must be done with the precautions already recommended; the small black tumour formed by the protruded iris must be eat down within the level of the cornea by repeated application of the caustic. After this we are to endeavour to promote the cicatrization of the ulcer.

In the same way are treated the small lymphatic tumours which project from the cornea, after an ulcer or wound. Scarpa proves that this tumour is the protrusion of the vitreous humour and its capsule.

DROPSY OF THE EYE.

LIKE every other part of the body, the vessels of the eye receive a constitutional disposition that keeps the proportions of the humours and coats in due relation. If this natural action of vessels be changed, the effect is some loss of transparency, or some preternatural growth; there is an atrophy or wasting of the eye, or a great increase of the humours, and a distension and growth of the coats—a dropsy of the eye.

Dropsy is sometimes a consequence of injury done to the eye, or of high inflammation; sometimes it attacks slowly and without any very evident cause. The symptoms are, a sense of distention with pain in the orbit and difficulty of moving the eyeball. Blindness ensues, and there is no longer contraction of the pupil. In a still greater degree of the disease, the eye projects conically from the eyelids, and they no longer shut upon the eyeball; the exposed surface becomes arid; there is inflammation and ulceration of the eyelids; the eyeball is inflamed with great pain and headach; the other eye is affected, by sympathy; and an operation becomes absolutely necessary.

THE OPERATION is simple. The eyelids are held open; a sharp tenaculum is thrust through the anterior half of the eyeball, and all the projecting part is cut off with two motions of the scalpel. The humours are of course spontaneously evacuated, and the eye shrinks within the eyelids. But Scarpa again frightens us, and recommends instead of

of this, that the middle of the cornea be cut, as in the Staphyloma.

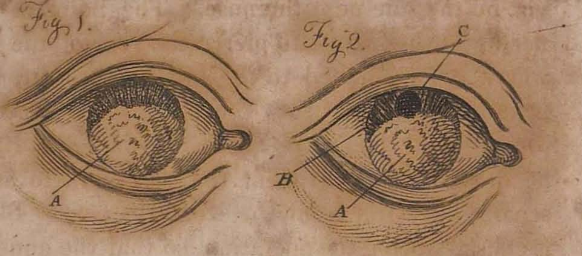
OF THE ARTIFICIAL PUPIL.

In deep inflammation of the eye, following the operation of extraction or depression of the cataract, the pupil contracts and closes altogether; for during the inflammation there being also great irritability of the eye, attended with contraction of the pupil, the iris fixes and adheres, so that there is an entire obstruction to the light. The contraction of the pupil is sometimes more unaccountable, being gradual, and only accompanied with a degree of irritability in the eye. I believe this disposition may be counteracted by the use of the belladona. It is natural to suppose that it would be an easy operation to introduce the couching needle, and cut the iris in the middle part, so as to enlarge the contracted pupil, or form a new one. But it is found, that when the pupil is made in the centre of the iris it quickly closes again. So it happens when the circle of the iris is divided from the circumference through its edge. Scarpa performs the operation in this way.

The patient is seated as for the operation on the cataract. The surgeon uses a very small, straight couching needle. He perforates the sclerotic coat, as for the depression of the cataract, and about two lines from the margin of the cornea; the point of the needle is carried behind the iris, and before the lens. It is made to advance as far as the upper and

and internal part of the outer margin of the iris, viz. on the side next the nose. The point of the needle is then made to pierce the root of the iris, where it is attached to the ciliary ligament, and when the surgeon sees the point of the needle projecting through the outer margin of the iris, he draws the instrument towards him, so as to separate the iris from the slcerotic coat. Blood is effused during the operation, so that the aqueous humour becomes turbid, the pain is greater than in the depression of the cataract, and for these reasons the motion of the needle should be decided and quick. I am inclined to perform this operation very differently from this method of Scarpa; but as I have not performed it at all, I shall say nothing further here.

Some time ago, before I had occasion to consider this subject of the contraction of the natural pupil, a patient applied to me who had an opacity of the cornea, covering the natural pupil. As the gentleman possessed the sight of the other eye, I did not advise an operation, which yet I thought practicable, if he had been blind altogether. I thought of opening the iris opposite to the transparent part of the cornea.



These sketches of the eye will illustrate what I conceived it possible to do. In figure 1. the opaque cornea at A. covers the pupil, the relative place of which is marked by a circular line of dots. In figure 2. I have represented a pupil formed by cutting the iris opposite the transparent part of the cornea. A. The opacity of the cornea covering the natural pupil. B. Part of the iris seen. C. The artificial pupil.

But of late more than I have surmised has been accomplished: the objections made to the operation of Cheselden have been proved to be ill founded, or to be counteracted by the use of the belladona. I have the more pleasure in announcing to my reader the success of Mr. Adams, since I have seen the operations both of M. Munoire and of the late Mr. Gibson attempted without success.

EXTIRPATION OF THE EYE.

The patient is placed on a chair, with his head resting on the assistant's breast. The assistant

should hold in his hand a blunt hook with which he is to raise the eyelid. The surgeon is seated before the patient. He now pierces the anterior segment of the eye with his tenaculum. The first strokes of the knife are two semicircular incisions, to cut through the tunica conjunctiva, and to separate the eyelid from the eyeball. Then if the eye is very much distended and fills the socket, the next motion of the surgeon's knife ought to be to puncture the eyeball, and allow some of the humours to escape; for, if this is not done, he is cutting in a constrained and narrow way, betwixt the distended eye and the socket, making a tedious operation, and endangering more than necessary, the bones of the socket.

When the conjunctiva is cut, and the knife has gone quite round the eye, and the attachments of the two oblique muscles are cut through, the eye would lie loose, only that the optic nerve retains it very strongly. I have seen the surgeon unaccountably forget this, and make repeated and most painful efforts, by cutting and pulling, when it only was required that he should have cut across the optic nerve.

To cut across the optic nerve, the knife ought to be carried flat under the superciliary ridge, and made to glide along the orbital plate. When passed over the eyeball in this direction, a single cut will sever the nerve and muscles which surround it, so as to relieve the diseased parts, and they may be drawn out with only a little adhering cellular membrane.

A good

A good deal of blood should be allowed to flow. If it be required to stop the too profuse bleeding, it may be done by pressing a little dry lint in the inner angle.

INSTRUMENTS.

A STRONG flat tenaculum may do to pierce the ball of the eye with; or a large ligature is put through the eye with the common surgeon's needle, or what will be found more useful, and which will much shorten the painful period of preparation, is a hook of the form of the tenaculum, with a shoulder, to prevent its going farther into the globe of the eye than just to permit the point to transfix it. A crooked knife is recommended for this operation, but it will be found a bad exchange for the common scalpel.

The disease sometimes returns. It may be expected if the disease has been really cancerous, and if the parts external to the eyeball have been

the seat of the disease. From the confined nature of the part, the whole soft parts within the bone may have been tainted. If so, it will probably happen that when the wound has gone on regularly towards a cure for some time, when you would expect that it was about to close finally, it will stop, and instead of merely filling up, a fungus will rise from the orbit. When this has got to some head, the acute lancinating pain soon returns. Or if the wound has healed some months perhaps after the operation, hard tubercles will be felt in the surrounding integuments. Then comes pain striking to the back of the head, with burning pain deep in the orbit, and the brain being at last affected, the patient dies.

SECTION XI.

OPERATIONS FOR THE EXTIRPATION OF TUMOURS.

THE subject of tumours is involved in unusual obscurity. There has been much done of late to draw the attention of the profession to the subject; diseases have been accurately described, and most interesting cases brought forward; yet I feel at this moment the difficulty of entering on the subject without altogether deviating from modern authority. Theories have been entertained which I think defective; authors have supposed they were making accurate definitions when they were only framing hypotheses: and explanations of the nature of the economy have been offered that to me seem quite at variance with the laws of the animal economy.

SOME HINTS ON THE FORMATION OF TUMOURS.

Mr. Abernethy defines tumours to be such swellings as arise from some new production which made no part of the original composition of the body. By this definition he conceives that he has

excluded all simple enlargements of bones, joints, glands, &c. It appears to Mr. John Bell that every tumour is a mere accretion of nutritious particles, in skin, bone, gland, or muscle, according to the nature of the part: tumour is, in short, says he, either an increased nutrition, or an increased secretion, modified in its form and character by inflammation and ulceration.

There has been no critical examination, surely no important objection offered to the definition of tumour, "*morbosum voluminis augmentum*," which I conceive to be scientific and correct. To define what is unnatural we ought to take into consideration what constitutes the natural state of the parts of the body.

There is an influence governing the growth, shape, and magnitude of the body, and of the individual parts of it: the changes from infancy to age are in a series: there is an uninterrupted progression. Before the seed is put into the ground the tendency of its growth to the utmost maturity of the plant is fixed. In animals, before the first pulsation of the *punctum saliens* is seen in the embryo, the actions of the system which lead to all the peculiarities in the mature animal, are fixed also. They follow in a natural course to perfection, in form, movement, and function. As the whole animal is, so are the parts, governed in their growth; the form of a finger is prescribed; the action of its vessels is under an influence which restrains the form and constitution. If the part is cut, it unites again; not

not by a "stimulus of necessity," nor by a "disposition of renovation:" there is no necessity for using this unintelligible language. What governs the constitution of the part in health unites it by adhesion, or circumcribes the new formed granulations when it is cut, or injured, so that they rise to the surface, but no further. There is no necessity, nay, there is no foundation for supposing, that an alteration in structure, or in the action of the part, (further than in degree,) is necessary to its closing when cut, to its restoration when injured. When we reflect that every part in its natural state is continually changing, not for a day remaining actually the same in all its parts, but that absorption and deposition are going forward perpetually, while the external character and form, the internal structure, and the very constitution of the part, remain the same, need we seek for any other explanation of the healing and the restitution of a part injured than the continuance of the same uniform influence, the same action of vessels? A silent and imperceptible influence preserves the part during the necessary changes from youth to age: by violence this influence becomes apparent, which is owing to the demonstrable nature of its effects, not to the change of its action. We cannot judge of the action of vessels but by their effects; when we see that the tendency of increased action is to the restitution of the frame to its original and perfect state, we must consider the action as natural; as still influenced by the same principle,

ciple which originally formed it, and by which, during a course of changes, it was preserved.

These considerations, I hope, will lead us to adhere to the definition of tumour given by other surgical pathologists. We shall be enabled to distinguish betwixt mere tumefaction and confirmed *tumour*, while, I hope, we shall be led to a rational principle of practice.

A swelling is a mere consequence of over-action in vessels where yet there is no change or modification; in this case the mere reduction of the strength and activity of the part will be followed by the reduction of the tumefaction.

A tumour, on the contrary, is a circumscribed swelling, with new modification of the structure *,

* On the term tumour, the following observations of Mr. Pearson are most pertinent: "Chirurgical writers have generally enumerated *tumour* as an essential symptom of the scirrhus; and it is very true, that this disease is often accompanied with an increase of bulk in the part affected. From long and careful observation I am however induced to think, that an addition to the quantity of matter is rather an accidental than a necessary consequence, of the presence of this peculiar affection. When the breast is the seat of a scirrhus, the altered part is hard, perhaps unequal in its figure, and definite; but these symptoms are not always connected with an actual increase in the dimensions of the breast: on the contrary, the true scirrhus is frequently accompanied with a contraction, and diminution of bulk, a retraction of the nipple, and a puckered state of the skin.

The irritation produced by an indurated substance lying in the breast, will very often cause a determination of blood to that organ, and a consequent enlargement of it; but I consider this as an inflammatory state of the surrounding parts, excited by the scirrhus acting as a remote cause, and by no means essential to the original complaint.

which

which arises in consequence of a specific action; does not spontaneously disappear; and will not subside by the mere subtraction of blood, or diminution of activity in the vessels. A tumour is often superadded to the natural body, but is constituted sometimes by the preternatural augmentation of a natural part; for example, of a gland, in consequence of a specific change, and increased activity of the vessels of the part.

In illustration of what I have here delivered I venture to add this example: When a man breaks his leg I conceive it is healed, not by a new action, not by a stimulus of necessity, which implies the residence of an intelligent principle, but by the continuance of that uniform influence which brought it from cartilage to bone, which prescribed the form of the bone, which preserved its form whilst its particles were changing daily. Those operations we did not see: neither the destruction, nor the renovation of the parts; but now we see the renovation because the destruction and injury were palpable; and this, not from the change of action, but from the change of circumstances. When, however, the new bone is not level with the old, when it is different in structure and redundant, there is something out of course and unnatural; there is disease; the vessels have not merely received an impulse of activity, but there is a new influence. If the diseased action should here build up a large protuberance, I call that exostosis TUMOUR, though it be of the same blood and bone with the original part.

The

The changes which take place in the body are not so gross and palpable as to be manifest to our senses; we can see no difference often in a mild ulcer, and in one which will be pregnant with mortal contagion. If we are to take only the grosser distinctions of matter as pointing out the difference betwixt tumour and swelling, we shall be in perpetual difficulty; if an exostosis be no tumour because it is only the original matter, is an accumulation of flesh and bone a tumour? or is a large tumour, full of bone, and membranes, and vessels, and flesh, which grows amongst soft parts, to be considered as a proper tumour? or is it only a tumour when it contains grey matter, or something unlike what we see in the natural structure of the body? If this last circumstance be taken as the true definition of tumour, then many circumscribed swellings of specific action, fatal from the tendency of that action, or the peculiarity of their place, which resist all known means of cure, and absolutely require the knife, are left still to be classed. Another important consideration in practice is, that the place and tendency of the action in the tumour being ascertained, the line of practice is clear; but if our attention be drawn to the distinctions of internal structure only, to distinctions which have no corresponding outward sign to mark their existence in the living body, we are led from the rule of practice, and left without a guide.

Surely there is great imperfection in the very first step of Mr. Abernethy's classification; his first genus being known from the tumour being composed

posed of the coagulable part of the blood rendered very generally vascular. This vascular coagulable lymph is the forerunner of all natural changes of the parts in health and vigour. So Mr. Hey, in describing the fungus hæmatodes, remarks, that the origin of the tumour must have been extravasated fluid become organized; and then he asks, was it blood mixed with a large proportion of lymph? Neither the microscope, nor chemical analysis of the solid, or fluid contents of tumours, will ever serve to point out the character which is to guide us in practice; we must take into consideration the peculiarities, constitutional and local, and as far as we are able endeavour to recognize the external character, and study the course of the disease, as the most likely to make us acquainted with the peculiarity and tendency of the action. In this investigation we must often recur to the dissection of the tumour, and to the internal structure as our guide; but the knowledge of the internal structure can be useful only as it directs our inquiries, or enables us to judge of a patient's danger by the outward sign.

I hope my reader will allow me to detain him from the practical part of this tract a little longer, in order that I may explain my opinion on the subject of tumours formed out of coagulated blood. The observations of Mr. Hunter on this subject being, as I think, the foundation of the common opinion, the following excerpt may be taken as explanatory of it.

"In

"In the course of his experiments and observations, instituted with a view to establish a living principle in the blood, Mr. Hunter was naturally induced to attend to the phenomena which took place when that fluid was extravasated, whether in consequence of accidental violence, or other circumstances. The first change which took place he found to be coagulation: and the coagulum thus formed, if in contact with living parts, did not produce an irritation similar to extraneous matter, nor was it absorbed and taken back into the constitution, but, in many instances, preserved its living principle, and became vascular, receiving branches from the neighbouring blood-vessels for its support; it afterwards underwent changes, rendering it similar to the parts to which it was attached, and which supplied it with nourishment."

"In attending to cases of this kind, he found that where a coagulum adhered to a surface, which varied its position, adapting it to the motions of some other part, the attachment was necessarily diminished by the friction, rendering it in some instances pendulous, and in others breaking it off entirely. To illustrate this by an example, I shall mention an instance which occurred in the examination of a dead body. The cavity of the abdomen was opened, to examine the state of its contents, and there appeared lying upon the peritoneum a small portion of red blood, recently coagulated; this, upon examination, was found connected to the surface upon which it had been deposited, by

by an attachment half an inch long, and this neck had been formed before the coagulum had lost its red colour. This steeped in water, so as to become white, appeared like a pendulous tumour."

"From this case it became easy to explain the mode in which those pendulous bodies are formed that sometimes occur attached to the inside of circumscribed cavities, and the principle being established, it became equally easy for Mr. Hunter to apply it under other circumstances, since it is evident from a known law in the animal economy, that extravasated blood, when rendered an organized part of the body, can assume the nature of the parts into which it is effused, and consequently the same coagulum which in the abdomen formed a soft tumour, when situated on a bone, or in the neighbourhood of bone, forms more commonly a hard one. The cartilages found in the knee-joint, therefore, appeared to him to originate from a deposit of coagulated blood upon the end of one of the bones, which had acquired the nature of cartilage, and had afterwards been separated."

Mr. Abernethy continues the subject in these words: "Had vessels shot through the slender neck, and organized the clot of blood, observed by Mr. Hunter, it would then have become a living part, it might have grown to an indefinite magnitude, and its nature and progress would probably have depended on the organization which it had assumed. I have in my possession a tumour, doubtless formed in the manner Mr. Hunter has described, which hung pendulous from the front of

the

the peritoneum, and in which the organization and consequent actions have been so far completed, that the body of the tumour has become a lump of fat, whilst the neck is merely of a fibrous and vascular texture. There can be little doubt, but that tumours form every where in the same manner. The coagulable part of the blood being either accidentally effused, or deposited in consequence of disease, becomes afterwards an organized and living part, by the growth of the adjacent vessels and nerves into it. When the deposited substance has its attachment by a single thread, all its vascular supply must proceed through that part; but in other cases the vessels shoot into it irregularly at various parts of its surface. Thus an unorganized concrete becomes a living tumour, which has at first no perceptible peculiarity as to its nature: though it derives a supply of nourishment from the surrounding parts, it seems to live and grow by its own independent powers; and the future structure which it may acquire, seems to depend on the operation of its own vessels. When the organization of a gland becomes changed into that unnatural structure which is observable in tumours, it may be thought in some degree to contradict those observations: but in this case the substance of the gland is the matrix in which the tumour is formed."

When Mr. Hunter, Mr. Abernethy, Mr. Home, Mr. Hey, and Mr. John Bell, give up their time to the investigation of the nature of tumours, it is an injunction on me to do my utmost to satisfy my reader on the subject. Perhaps some of these

gentlemen may feel contempt and indignation at the idea of controverting opinions so substantiated as these I have transcribed. But in a science so interesting, the assumption of superiority is a singular instance of inconsistency, and whoever makes the philosophy of the living body his study, may be taught humility, and from his own errors learn to look mildly on those of others.

I would have my reader to recollect the phenomena of the formation of bone in cartilage, in membranes, or in that mass which we are accustomed to call callus, and which is around the ends of a broken bone; I would have him consider the formation of new membranes; the adhesion of the soft parts by an intermediate substance; as well as the formation of tumours from coagulum, as it is imagined.

1. I think the leading error of this doctrine arises from inattention to the distinction between the coagulum thrown out from the organized extremity, and that which is spilt as it were by the accidental rupture of a vessel. In the one instance it is a secretion; and in the other a mere extravasation possessed of no power of reproduction; absorbed, if in a small quantity; a source of inflammation and suppuration, if in a great quantity. I must see the coagulum of blood thrown out in apoplexy, and in aneurism, become full of vessels, before I yield up the conviction that the coagulum of blood accidentally thrown out is absorbed, and a new disposition secreted, previous to the formation of vessels in it.

2. It is a matter of surprize to me, how the physiologists, who support the original observation of Mr. Hunter, can adhere with such devotion to the belief that this coagulum formed a connexion with the peritoneum; when if that fact were so, viz. that coagulum of pure blood formed adhesion to that, or any other surface, and grew there, it would be as familiarly known to every surgeon, as it is demonstrable that extravasated blood is absorbed, and that a limb turgid with extravasated blood will resume its form.

3. We frequently have coagulum thrown out from inflamed surfaces with such a proportion of the colouring particles of the blood, as to appear like a pure coagulum of blood somewhat blanched; and I have no doubt the coagulum found by Mr. Hunter was of this nature. But while I believe that the pure coagulum of blood escaped from the rupture of an artery, or a vein, has no power of adhesion, or of forming vessels within it, yet if circumstances should present themselves to convince me of my error, the following view of the subject would stand uncontroverted by that circumstance.

4. Every part having a peculiarity of structure, preserves that peculiarity by the prescribed modification in the activity of its vessels; this modification is continued when the part is injured, or cut, and the renovated matter is consequently like the original substance. Violent injury will sometimes interrupt this natural renovation; but on the subsiding of the violent commotion, and the return of the natural action, the part is reinstated. As, how-

however, the functions (and we may perhaps venture to say the structure) of some parts of the body are more delicate and peculiar, these are not restored in all their pristine perfection, though always with such a relation to it as to show that the bond of union of the divided parts is not the same in all, but holds a relation to the original formation.

5. If a bone is broken, a coagulum is thrown out; the vessels of the bone penetrate this coagulum, and the vessels of bone deposit bone. Such is the received explanation of the formation of new matter of bone, and a most imperfect one it is. This opinion does not at all correspond with the facts, which stand thus: The mass which we call callus, and which surrounds the broken ends of bones, is supplied with vessels principally from the surrounding soft parts, and yet bone is formed. If, therefore, the source from which the vessels chance to be derived influenced their action, muscle and membrane would be formed, instead of earthy matter deposited. The fact is, that the original coagulum of blood, which is, by the violence of the accident, and the rupture of vessels, thrown out around the extremities of the bone, is absorbed, and a new deposition is slowly secreted; the source of that secretion is the bone, and bone is formed in that nidus so secreted, although the vessels supplying it with blood be from parts entirely different in structure and use. An artery does not bore and work its way into a coagulum as has been described. Some people's minds are easily

easily satisfied! and when they think of the force of the circulation, they conceive it an evident and likely thing that the blood forces its way forward; that the arteries push out and enter this substance, without ever imagining it necessary to consider how veins, and lymphatics, and nerves, make their way into this new matter. It appears to me, that this secreted coagulum in the very act of its formation receives its character; that its structure is already determined; that the tract of its vessels is laid; that the parts are in embryo: when blood is received, the previous determined structure influences the secretion to be poured into it, and thus bone forms bone.

Hitherto we have been speaking of natural changes of renovation; — tumours are unhealthy superstructures. If tumour forms from coagulum, that coagulum is not the mere blood escaped from the vessels, but a coagulable part secreted by the vessels of the surface, under a peculiar influence in their action; and according to that action is the growth of the future tumour. Its character, the matter secreted into it, and the proper substance of it, depend on the original formation; in other words, on the influence of the vessels which secreted the coagulum.

The following scheme of tumours, reduced under four heads, are meant only to supply the reader with the common terms, the subject is still in great obscurity.

I. INCYSTED TUMOURS. (*Cystides.*)

WE must distinguish the term cyst from capsule, which latter, I think, ought to signify the condensation of the cellular substance round a tumour.

The incysted tumours consist of a cyst, the contents of which are secreted by its inner surface.

HYDATIDES.—Delicate incysted tumours often gregate, and entangled in the cellular membrane.

The incysted tumours containing lymph, or serum, have been called *hygroma*.

Even here, in the first step of our inquiry, we are at a loss to mark the distinction betwixt tumours of the cellular membrane, and those transparent bags uniformly round and smooth, filled with clear water, and which have no adhesion, which are distinct animals: "they produce their like, and multiply." Although these animals cannot be considered as tumours, being themselves animals, yet they become a character of disease, since I imagine that there is a previous nidus for them in a change of vascular structure, or action. There is yet a third distinction under the head *hydatid*, more distinctly animals, the *tenia hydatiginea.* These I have found in the monkey, sheep, and hare. They adhere to the vascular membranes of the viscera, by a pendulous membranous sac, which has vessels branching on it; within this sac the hydatid is contained quite loose. Some of them in the same animal I have seen with one mouth, some with two, and others smooth and without any, which led me to doubt whether these white corrugated projections on the sac were indeed the mouths of the animal.

animal. I have found a worm like the tenia, and these tenia hydatiginea floating loose in the abdomen of the same animal.

Ganglion. — A solitary incysted tumour, connected with tendons or ligaments.

Ranula. — An incysted tumour under the tongue, or projecting on the inside of the cheek.

I would place here, under the head of incysted tumours, sacs containing fluid blood, such as I have seen about the throat.

Cysts containing matter dense, like these three last examples, have been called *lupia*.

Meliceris. — An incysted tumour, the matter being of the consistence of honey.

Atheroma. — An incysted tumour, the matter contained being pultaceous.

Steatoma. — An incysted tumour, the contents of which are fatty, or like suet.

II. GLANDULAR TUMOURS.

1. Scrophulus tumours.

2. Sarcoma. — A tumour, to the feeling of the consistence of flesh.

Under this head we must place a very great variety of diseased enlargement of the glands, varying in the kind of glands they attack, in their outward character, in the celerity of their growth, in their termination, and in the appearance of their contents.

There will of course fall under this head several tumours of distinct glands: as,

Bron-

Bronchocele. — Enlargement of the thyroid gland.

Sarcocele. — Fleshy tumour of the testicle, or cord.

3. SCIRRHUS. A hard, irregular, and indolent tumour of a gland. The knobby hardness of a tumour is, no doubt, an alarming circumstance, but such indolent affections of the glands often appear in mature years, which prove unconquerable, and yet continue innocent to the latest period of life. When surgeons speak of the true and exquisite scirrhus they mean the carcinoma.

4. CARCINOMA. — A tumour of a gland, in a state of activity approaching to cancerous ulceration*. The tumour is hard and unequal; there is a lancinating pain in it; the skin is purple, or livid red; and the cutaneous veins are enlarged.

☞ To the term CANCER we find the words *apertus* and *ocultus* joined; the first meaning the open ulceration; and the other, the sense I have given to *Carcinoma*. The spreading of varicose veins over the surface of a tumour being considered as a symptom of great malignity, was the reason of the term *cancer* being used; they conceived they saw

* When a surgeon writes that his patient is strumous, the case is undefined; but there are swelled glands with suspicion of scrophula. If he says, he has scirrhus tumours about the neck, I understand, somewhat indefinitely, that they are hard and knobby, and suspicious in their nature; but when he says, that they are carcinomatous, I imagine he has no doubt from the veins about them; from the hardness and lancinating pain, and increased inflammation, that they are cancerous, and of a fatal kind.

 a resem-

a resemblance in the branching of the veins to the claws of the crab! A true cancer, arrived at ulceration, has the edge of the ulcer serrated, indurated, retorted; the errosions betwixt the excrescences are deep, and bleed from time to time; there is constant burning pain, and the discharge is sordid, sanious, and peculiar in its fætor.

Internal parts and canals having a glandular structure, though not the outward form of glands, partake of the scirrhus and carcinoma. We have the disease in the œsophagus, in the stomach, in the rectum, &c.

5. Bubo. — A hard, phlegmonous, swelling of a lymphatic gland, from disease received through the absorbent system; or symptomatic of acute and malignant constitutional derangement.

We are quite unable to distinguish accurately the characters of the tumours of which the glands are the nidus. There is a very great variety of them, proceeding from the changed disposition of the vascular action. We sometimes find a solitary tumour about the throat, which will at last inflame, and become active and cancerous. Another case will present, where, with the same character, we see that the disposition spreads, and there are many glands diseased; and on occasions, that the disease is not confined to the lymphatic glands, but spreads to the salivary and thyroid glands. Sometimes we see a disease commencing in the glandular structure, propagated without seeming preference to parts of the same original structure with the gland; but involving skin, cellular membrane,

brane, and even muscle and bone, in a diseased assimilated action.

III. VARIX.

VARIX is a tumour of enlarged veins. When the vessels are distended, it is not in breadth only, but in length also; and to accommodate themselves they must necessarily be twisted. But neither *varix* nor *aneurism* ought to be considered as tumours, for there is no peculiarity of action amounting to disease; it is but at most a derangement of mechanism, the mere effect of pressure.

However as the derangement of the natural action always endangers the substitution of permanent disease, so in instances of mere distention of veins we find diseased action to be a consequence of it, as in the instance of *hæmorrhoids*, (tumours on the verge of the anus,) which, though at first a mere distention of the veins and cellular membrane by blood, or lymph, become firm fleshy tumours. (*Marisca.*)

But it is of consequence we should particularly notice, that besides venous distention being a mere effect of the pressure of the blood; and besides, being a sign on the surface of solid tumours of virulence within; that there are tumours of varicose veins, distinct altogether in character from these, and which have a history so peculiar, that I deem it right to put them under a different head altogether. See *Hypersarcosis.*

IV. EXCRES-

IV. EXCRESCENTIÆ.

Polypus. — A pendulous tumour from a canal or cavity.

Cartilaginous tumours appended to the inner surface of the capsular ligaments of joints.

A question still remains to be decided; — are the loose cartilages in the knee-joint of the same origin with those attached to cartilaginous bodies? If it is concluded that they are, and that they are excrescences of the natural cartilage, how do we account for bodies of the same kind being found loose in the vaginal coat of the testicle?

Veruca. — A warty, cutaneous excrescence.

Exostosis. — The excrescence from a bone where there is no general enlargement.

Nodus. — The thickening of the membranes which cover a bone; it is often the same disease with the last.

Fungus. — This term implies the soft excrescence from a surface; as of a bone, or of the dura mater.

Nævus. — (*Nævus maternus.*) A flat congenital excrescence of the skin. Sometimes rough and warty; often with hair upon it; of a purple, reddish, blue, or black, colour.

It is only in common language that we can call a corn, (*clavus,*) a tumour; for it is a mere effect of pressure. There is no diseased action, but the continuation of a natural action; an action of a kind in other circumstances to preserve the body. The accumulation of the layers of the cuticle on the

the palms of the hands and soles of the feet, as a consequence of use and pressure, is a happy provision for the protection of the parts beneath. But when pressure is on a point, there the accumulated cuticle acquires a hardness equal to horn, and bears on the soft parts beneath.

Under this head of *Excrescentiæ* there might be enumerated many terms which imply tumours of particular parts; as for example:

EPULIS. — A tumour of the gums and alveoli.

PTERYGIUM, or PTERYGION. — A thickening of the tunica conjunctiva.

ENCANTHIS. — A tumour of the inner angle of the eye, in the seat of the caruncula lacrymalis.

STAPHYLOMA. — A tumour of the cornea, &c.

V. THE DISEASED GROWTH OF A VASCULAR, FLESHY SUBSTANCE, INVOLVING THE PARTS PROMISCUOUSLY. (*Hypersarcosis.*)

UNDER this head I put such tumours as are of a fleshy consistence, and not distinctly of glandular origin, but which spread equally around.

FUNGUS HÆMATODES of Mr. Hey. This disease may take its origin in muscle, cellular membrane, or even bone. Sometimes it begins as a distinct tumour; sometimes as a general enlargement of the part; as of the leg, thigh, or shoulder generally it is not painful. It is irregularly soft, (of uneven density,) and to the feeling there is a sensation of extravasated fluid, yet not of a fluid in a distinct sac. There is no irregular hardness; and no puckering of the skin. If it be seated under the

the fascia the distention has a considerable elasticity. The veins on the surface are much enlarged In its progress the tumour bursts; and a soft, dark coloured, bloody excrescence rises from the centre, which bleeds freely, and reduces the patient's strength. The irritation, and the hæmorrhagy together, carry him off. When this tumour is opened in the life of the patient, the bleeding is profuse. When its contents are examined after extirpation, there is a greasy, ash coloured substance in the midst of a vascular bed.

Aneurism by Anastamosis of Mr. John Bell.—This tumour, for the most part, has its origin in the skin, but it involves every living part in its progress. Its origin is often from those marks on children called *nævi materni*; but sometimes, apparently from injury of the skin in the adult. The disease is, for the most part long stationary, when, without any apparent cause, the action of the vessels acquires vigour, the pulsation becomes perceptible, and the tumour sensibly increases. The colour of the tumour is a blackish blue or purple, and on the most prominent part there is an excrescence like a mulberry, which bleeds profusely from time to time. The substance of the tumour is cellular, and contains pure liquid blood. The blood can be pressed from it, and, to the feeling, the bags are soft and woolly. It destroys the patient by hæmorrhagy. When dissected it is like a mass of placenta.

This disease cannot be called an *aneurism*, which is a pulsating tumour of blood, from a mere injury of

of the machine, from a yielding of the coats of the arteries without any peculiar action. It is not a *varix*, which is a mere venous dilatation in consequence of an impeded return of the blood. In this tumour, on the contrary, there is a specific and very peculiar action, and nothing resembling either the impeded circulation of aneurism or varix.

ANOMALOUS TUMOUR. — Under this name, in various collections, we have both of the last-mentioned cases; but besides such as correspond with these of Mr. Hey and Mr. John Bell, there still remain many tumours of the bones, muscles, and skin, which entirely differ from them, and which have had as yet no name given them. I have dissected a tumour of large size, which it was impossible to say resembled most the steatomatous tumour, or the vascular tumour described by Mr. John Bell, and in the substance of the tumour there were many cells full of liquid blood. These cells were not the irregular cavities of varicose vessels, but of a perfectly regular form, they had a smooth secreting surface. I would have called them hydatids but for their contents.

The nature of the OSTEO-STEATOMATOUS and OSTEO-SARCOMATOUS tumours is but little known: the first term implies the growth of a steatome in the marrow of the bone, in which the bone enlarging becomes a shell to the fatty tumour, until perhaps the softer substance bursts through the bone *. The term osteo-sarcomatous describes that

* In the greatest enlargement of a bone it often occurs, that what appears like an immense bone is but a shell. When the bony

that softening and enlargement of a bone in which the tumour exhibits a mixture of soft and bony matter and softer fleshy substance. But the action of the vessels, the nature of these tumours, partakes of a great variety. Indeed the term STEATOM gives us an improper idea of the common fatty tumour of the body, which is a diseased acretion of fat nourished by vessels, and often without a cyst, or much to distinguish them from the common fat but their inordinate growth.

It is not in vindication of the imperfection of this sketch of a classification of tumours that I venture to throw out a doubt of the possibility of making a perfect catalogue and description of them. Without boasting of how much I have seen, I may assert, that I have seen a distracting multiplicity in the character of tumours. I have seen lately, and expect often to see, tumours which bear no accurate resemblance to such as I have seen before, or such as I find described. Tumours are not like animals, each proceeding

---

bony matter is absorbed on one side of a bone, we see it accumulated on the other; when wasting without accumulated within! in short, when there are the most decided ravages of disease the bone is strangely disfigured, but still the mass of earthy matter remains nearly the same. In considering this disease of *osteo steatoma*, or of the cases which I have seen, when the tumour of aneurism, and the formation of bone went on together; it appears, that the bony matter forms a shell as long as the original quantity of matter is not exhausted; at last, however, the growth of the original tumour becoming too large, the thin shell of bone is absorbed over the most prominent part of the tumour, and the tumour seems to burst through.

from

from a stock, and bearing the mark of that origin. They are not like the diseases of the natural body, which, in similar circumstances, is always similarly affected. But, to use the words of Mr. Abernethy, they are edifices which are built up by diseased actions, and in which these diseased actions reside. There is in this opinion much to ponder on and to admire. The matter in which the action resides, is the result of disease; the disease varies in its nature; the structure of that matter, so formed, slightly deviating, must affect the action residing in it; and that action having no doubt the character of all deviations from nature, viz. a less definite and circumscribed existence, may be undoubtedly varied and modified. Thus it appears to me that new *diseases* are formed in many of the individual tumours, though they are not propagated: a correct general classification may no doubt be expected from careful observation, but I think it will ever be liable to derangement by the observation of individual cases.

OF THE TREATMENT OF TUMOURS.

Of a swelled gland. It is only by the continuance and obstinacy of a tumour in resisting remedies, that we know it to have such a peculiarity of action, as to afford little hopes of its resolving. In the beginning of every tumour, therefore, much the same practice may be pursued; and I shall state what is right to be done, under the idea that we still hope that it is merely a gland acci-

accidentally swelled; and where the diminution of the action may be followed by the decrease of size, and the restoration of its natural function.

When a patient comes to us with a swelled lymphatic gland, we first consider the probability there is of its being in consequence of some irritation in the course of the absorbents; or we attend to the probability of its being scrophulous and constitutional. If we find it a solitary swelling of a lymphatic gland, for example, in the neck, we take into consideration its seat, and the course of the vessels; there is, perhaps, a scabby eruption about the roots of the hair, a gum-boil, ulcerated sore throat, discharge from the nose, &c. If there should not be one, but many glands swelled, and indurated, we must look to the age and constitution, and not commit the error of treating wholly as a local disease that which has its origin in the prevailing tendency of the system.

When a gland enlarges, leeches are to be applied, and the part frequently bathed with tepid water; on the second and fourth day they are to be repeated; and when the bites have healed a blister is applied over the tumour. If, however, the gland shows itself to have much inflammation, a blister will aggravate and increase the swelling; and even in cases where the gland seems indolent, it is necessary to secure a certain degree of weakness in the vascular action of the part, before any thing stimulating be applied to the surface. I have seen much advantage from the use of vomits in discussing inflamed glands.

When glands enlarge from the action of cold in a scrophulous constitution, cold wet applications are to be avoided; indeed, in that case it will be better to have recourse to warm fomentation of decoction of camomile, and of sal ammoniac, or of salt and water, or of gentle and long-continued friction with the hand, or with stimulating oils. The part should be kept warm; and if the above plan is found too troublesome to be employed, in the absence of affectionate care, a warm plaster of cummin-seed may be applied.

If we find that there is a concealed scrophulous action in the system, but that where the skin is exposed, there chiefly the glands swell, it is most probable that the glands are suffering by sympathy with the skin; which is the reason I recommend the plan of fomentation and friction: but when a lymphatic gland, even in a scrophulous constitution rises above a certain degree of activity; for example, when a particular gland of the neck becomes more distinctly enlarged above the others, which cluster in the neck and about the jaws, the continual application of cold spirituous embrocation, and keeping a wet rag on the tumour, will prevent suppuration, and make the tumour subside. When there is less activity, or when the inflammatory action is diminished, a blister may be applied over an enlarged gland, with much effect. The general explanation of the action of a blister is, that it excites the lymphatics, and consequently assists the absorption and diminution of the tumour. I imagine it is to be explained thus: if the blister be

applied where there is a tendency to inflammatory action, the stimulus is propagated backward upon the trunk of the vessels brought into activity; but if the power of re-action be previously subdued, then this irritation makes a revulsion from the deep parts, by bringing the blood, which would otherwise pass to the deep parts to supply the superficial vessels: whatever diminishes the activity of a swelled gland restores the balance to the absorbents, which were previously overpowered by the activity of the arteries; for it would not be difficult to prove that the lymphatics are less under occasional influence than the arterial system.

While we endeavour to reduce the activity of a swelled gland by direct means, we must prescribe purgative medicines twice a week, and enjoin an abstemious diet; temperance is of the utmost consequence, where there is danger of a confirmed scirrhus. If the gland continues hard after this treatment, our next resource is an alterative treatment, by giving small doses of calomel. The extract of cicuta with calomel is a favourite remedy. Electricity is used, not as a counter-irritation, but as directly affecting the gland; it rouses its activity. We must be well aware of the mildness of the nature of a gland which we rouse to activity: no doubt, if there be no malignity in a gland, the rousing the vascular action may be productive of a change, and cause its final absorption; as it is sometimes observed, that a gland having been long

long indolent, swells, becomes painful, and then gradually disappears.

It is a different expectation, which makes the surgeon apply caustic to a tumour; he expects, that being of a mild, indolent nature, with little capacity of action in it, the life of the part (being diseased) may be too weak for the violent operation of the caustic, so that the whole part may slough out. It is not uncommon to see the whole of a cancerous breast slough out before the death of the patient, which is the death of the disease, preceding the death of the natural body. Such is the common effect of escarotics and caustics to a wart; the life of the excrescence is weaker than that of the natural parts on which it grows, and consequently while the application is too severe for the diseased action, the sound parts remain unhurt. But this application of caustic is a dangerous practice in the case of scirrhous tumours; instead of destroying the disease, it may only rouse it to activity.

When a tumour is excited to virulence by corroding, or stimulating applications, it is doubted whether the latent malignity of the disease be merely roused, or a new action be produced; our most intelligent surgeons seem to think that there is no such thing as the conversion of disease. Mr. Pearson expresses himself thus: "Writers have indeed said much about certain tumours changing their nature, and assuming a new character: but I strongly suspect, that the doctrine of the mutation of

of diseases into each other, stands upon a very uncertain foundation. Improper treatment may without doubt exasperate diseases, and render a complaint which appeared to be mild and tractable, dangerous or destructive; but to aggravate the symptoms, and to change the form of the disease, are things that ought not to be confounded. I do not affirm, that a breast which has been the seat of a mammary abscess, or a gland that has been affected by scrophula, may not become cancerous; for they might have suffered from this disease, had no previous complaint existed; but these morbid alterations generate no greater propensity to the cancer, than if the parts had always retained their natural condition." I cannot entirely agree with this opinion. I conceive that a part deprived of its natural action, is in a certain measure thrown out of the governance of the general economy, and is left a prey to irregular action, to disease. When a gland is injured by a blow, and the inflammation is gone high; if the natural structure and economy be deranged, permanent disease follows the subsiding of the mere inflammation. So we see that there is a period of life when the breast and womb become useless, and the influence of the system is no longer felt upon them; then disease fixes on them. I am not able to give any other explanation of the cancerous affections of the womb and mamma being so frequent at the turn of life. By pushing this discussion a little further I am led to conclude, that disease is not the effect of circumstance and impres-

impression, but that there is a latent tendency to certain diseases in most constitutions, which will take place in the absence of the natural controul, and that is of the healthy action.

OF THE OPERATION FOR CANCEROUS BREAST.

The mamma is a gland almost peculiar in this, that it has not a continued action and secretion. Whilst other glands continue their function uninterruptedly, this depends upon the state of the womb: its action, by remote sympathies, is at one time called forth, and again left for an interval to subside; and, finally, at the age of from forty to fifty, its function is entirely suppressed. Were we to take the instances of the womb and breasts, we should say that a cessation of accustomed action were ill to bear; and that the part exposed to it is apt to fall into cancer.

The perfect reliance which, within the last thirty years, has been placed on the excision of the mamma, for the intire extirpation of the cancer, is in the present day considerably diminished. And in the late publication of Sir E. Home, on cancer, the opinion of the older professor Munro, published in the Edinburgh Medical Essays, is supported, that after an operation performed too late, the disease is aggravated, or runs a more rapid course than it otherwise would have done. Perhaps the explanation of this is, that where parts are left unextirpated, which have a tendency or disposition to the disease, the operation acts as a blow would do, or any other violent cause of increased

increased action or inflammation, fostering and bringing forward the disease *. Often, I believe, the gland is like the tuberculated state of the lungs, an occasional excitement is only wanting to give vigour to the latent disease. This kind of reasoning would deter me from extirpating tumours situated in the substance of the gland, leaving the gland itself behind. The tumour must be very free and insulated, and superficial, which I would cut out without taking the breast along with it: for when such tumours have followed from blows, or kicks of the child, is there not reason to fear that a similar effect may follow to other parts of the breast, in consequence of cutting, bruising with the fingers, and tying ligatures on the glandular substance?

One of two things is proved by every day's experience, that either the disease apparent in one part is a mark and sign of some general predisposition in the surrounding parts, or the contamination from the centre of disease precedes all evidence of the commencement of diseased action in the surrounding parts.

Having under my daily observation the cancer-establishment in the Middlesex Hospital, I hope soon to be able to describe the variety of those

* The cancerous action is unlike in its progress to that of the common inflammations, which spread more quickly along the surface from cell to cell. It consolidates as it advances, and I conceive that the condensation of the cellular membrane by the inflammation which follows the operation, affords a more easy progress to the course of the cancerous action.

diseases,

diseases, which are classed under the term of cancer. At present, I wish merely to throw out a few practical hints for my reader's attention.

The disease generally begins at the period of the cessation of the menses. About that period the menses flow irregularly; sometimes intermit, and sometimes are accompanied with an unusual flooding. It is the same unequal action in the breast, which brings so many women to the surgeon, with swellings, and powerful stinging, and throbbing. This being neglected, the breast becomes indurated, irregular, and knobby; or, the general swelling subsiding, there is left a firm body in some part of the gland, the origin and centre of all the future mischief.

When upon questioning the patient, she tells us, that the lump in her breast was a consequence of a general and more violent inflammation of the whole breast, which subsiding, left this tumour, I conceive the circumstance very favourable. The disease most commonly arises as a distinct tumour; frequently a small portion of the gland becomes diseased, having a knotty, but not a circumscribed feeling.

The disease will often propagate itself in a succession of inflamed tubercles, extending to the integuments of the breast; and at the same time, involving in a direction internal the substance of the pectoral muscle, and the intercostal muscles. I have seen the bone and cartilage assimilated to the cancerous structure.

 When

When a purple colour is on the skin over the tumour, accompanied with shooting pains, it is a very unpropitious beginning. The operation should not be long delayed.

The worst cancer begins by a small hard tumour within the breast, with frequent stinging or lancing pains; the skin becomes attached to the tumour; assumes a livid colour, with enlarged veins; and is drawn down to the centre of the disease. If the operation were to be performed only in such cases, its reputation would have a very rapid decline: for a small irregular breast, with the nipple drawn in, and with stinging pain running towards the axilla, betokens the worst kind of cancer. *

There is a different disease to appearance, which very often, I think, presents to us a large stony irregular tumour of the breast, standing directly out, and not much attached. In the operation, this tumour is very easily turned off; whilst that described in the last paragraph, is very apt to adhere to the pectoral muscle, while the fat is at the same time much absorbed, and the integuments thin.

It is particularly necessary to know, that cancer propagates itself by dense lines of membrane, which shoot out and extend themselves in the surrounding substance of the gland and fat. Without knowing this, the surgeon would leave

* Scrophulous tumours are softer and less heavy than schirrous tumours: the ulcer is not so irregular, the edge is not everted and curling, and the skin is less drawn in and puckered.

these

these roots unextirpated; and it is this circumstance which makes it necessary, in operation, to go much wider of the hardened and tuberculated part than seems necessary. In other examples, the diseased portions assume a gristly character, which distinguish it from the surrounding healthy parts.

Sometimes cancer arises in the glands of the areola and nipple, and forming first extensive excoriation, fungous excrescences are next sent up. The whole breast at the same time swells, and becomes elastic, whilst the fungous tumours sink their roots deep, and the disease is an open and bleeding cancer. Whilst these excrescences rise in the centre, the skin around becomes diseased, and then there spreads a spurious kind of ulceration, which throws off the natural cuticle: from this new surface, at intervals, granulations sprout up like those in the centre. Like the other cancerous ulcers, this is attended with a severe burning pain. This species of cancer often does not admit of amputation, on account of the extent of the diseased skin at an early period of its progress. *

But

* When it is impossible to operate in such an instance of the disease, it is very necessary to know how we are to palliate and relieve the symptoms. Oily dressings promote the discharge, and keep the woman uncomfortable to herself, and disagreeable to her neighbours. Washes and wet cloths will be a great relief. Astringent washes of lime water, acetite of lead, laudanum and rosewater, &c. diminish the discharge, and suppress the general excitement and action, and burning heat of the surface. I have observed, that as the centre fungus enlarged and grew up, it was attended with a great increase of pain, a higher state of

But there is a more common fungus, which arises from the cancerous breast.

Where the central tumour attaches to the skin, an ulcer forms with ragged and distorted edges; the skin around is livid, and the veins distinct. From the centre of this ulcer, a fungous tumour rises with rapid growth. This fungous excrescence is soft, and of a dark dirty colour; it is like a dead substance; and, indeed, upon the surface, it sloughs and separates into pelicles. The discharge from the ulcer is thin and fœtid, and there often occurs alarming hæmorrhage.

When a tumour in the breast feels quite insulated and free, though suspicious, we may with propriety take time to use such means as occur to us to soften and resolve it *. But when it is felt as part of the mamma, and its confines are less distinctly marked, with a shooting stinging pain in it; or when there is a solid heavy tumour, which moves the whole breast, the operation should not be delayed.

When as yet the tumour has given no pain, when the surrounding parts are of a natural looseness

---

of vascular action, and more florid ulceration, which has been frequently checked by cutting the excrescences off by ligature, or destroying them by arsenical caustic.

* In the treatment of the breast, in whatever state of swelling and inflammation, from the milk breast to the cancerous state, the bandage or sling must not be neglected: it is an immediate relief. Whereas, if the breast hangs, it incessantly solicits increase of action to the parts. The T bandage is to be preferred: first it is made to encircle the body below the breast; and then the middle bandage being split, goes over the shoulders on each side of the neck.

and

and sound, it is considered as not having yet assumed the cancerous action. But when there is pain in the tumour, which is in the breast, especially if the tumour increases in size, and fixes to the surrounding parts, then are the surrounding parts, as well as the tumour, diseased; and, in operating, we should cut as wide of the apparent disease as possible.

We shall often have occasion to say to a patient, "That we are afraid the disease has gone too far, and that the operation may not only not eradicate the disease, but may somewhat accelerate its progress. But if the disease has not advanced so far as we apprehend, and of this we are by no means competent decidedly to judge, then an operation gives you safety: and in these circumstances, you must yourself judge for us."

LYMPHATIC GLANDS.

Long before the breast ulcerates, the lymphatic glands become affected; and, when diseased, their progress is rapid. If the disease of the breast be above the nipple, the glands towards the clavicle are in greatest danger of partaking of the disease: if between the nipple and sternum, (which is not frequently the case,) then the glands in the intercostal spaces, near the sternum, are to be examined with accuracy; and if the tumour be seated close to the nipple and below it, or between the nipple and the axilla, then the glands of the

the axilla are to be most particularly attended to.*

If the glands in the axilla have occasionally enlarged, and again subsided, it is more favourable than when they have become hard and enlarged by a slow and uniform progress. The glands in both sides should be examined and compared, for often the lymphatic glands are naturally large.

TREATMENT BEFORE OPERATION.

The first consideration, which, by the bye, the mere operating surgeon is apt to forget, is the connection betwixt the uterine system and the breast. We must recollect, the very peculiar effect of pregnancy on the mamma; and the change which takes place on menstruation, as well as from all changes of whatever kind produced in the uterine system.

There may be a swelling with tension, and throbbing in the breast. This may be a sympathethic swelling of the gland, or an occasional inflammation, excited by the presence of a diseased portion seated in the gland. Leeches, fomentation, and saline purges will remove this state of tension; and the repetition of the leeching or cupping, and the vinegar poultice, will secure the subsiding of the inflammatory swelling. After this, there may remain a harder nucleus, perceptible in the substance of the breast.

The indurations which are a consequence of the general inflammation, yield to friction with cam-

* See Sir Everard Home, on Cancer.

phorated

phorated mercurial ointment, and small doses of calomel. When this does not succeed, then more decided means must be used; frequent bleeding with leeches, even to the reduction of the general strength, and cold application; with milk, or vegetable diet. During the prosecution of this plan, I conceive it to be my duty to continue the exhibition of some of those medicines, which have the character of curing cancer. By persevering in a train of observations, we may expect, at length, to discover some specific for this disease.

But when the character of the disease is distinctly announced, as I have described it above, we are not warranted in delaying the operation.

OPERATION.

The patient should be seated on the edge of a strong table, and inclined backwards on pillows; the nurse supports her head, and a woman sits before her to prevent her slipping from the table. The surgeon takes his station on the diseased side of the patient.

The instruments, &c.—scalpels, hooks, and three or four tenacula, the common dressing-case, sponges, lint, compresses, split cloth and broad bandage, adhesive straps, wine and water.

1. The first incisions should include the nipple and areola: these are useless when the breast is away. The first incision should begin on the margin of the tumour nearest the clavicle, and be brought down on the outside of the areola, and

in a direction across the pectoral muscle, passing with a very slight curve an inch and a half beyond the base of the diseased breast at its lowest part. Let it be remembered, that if the integuments are not fully laid open at first, the surgeon will find it necessary to turn out the skin upon his knuckles with great force, and he is very apt to cut through the flap! In taking up the arteries, too, he finds himself poking in a deep sac, from which it is difficult to clear away the blood.

2. Beginning the second incision as the first, but deviating at an acute angle from its direction, we come on the inside of the areola, and then again converging to the tract of the first, unite them below.

3. Our next step is to dissect off two lateral flaps of the integuments from the outer hemisphere of the tumour; in doing which, no vessels of consequence will throw out their blood.

4. Our next care will be to dissect off the tumour from the pectoral muscle. In doing this we begin the dissection at the upper part, and draw the tumour down.

5. As soon as we have penetrated deep, the external mammary artery, which supplies the breast, will probably spring: I conceive that it should be tied now. Proceeding to dissect the gland downwards, we tie such arteries as seem to throw out their blood with force. But if the assistant be dexterous whilst he holds aside the integuments, he will grasp these lesser arteries also, or put his finger upon them, so as to allow the operation to proceed, and

and the tumour to be taken entirely away. The assistant then presses a large soft sponge upon the wound, until the surgeon has dried his fingers, and is prepared to take up the bleeding vessels.

I have dissected out the mamma in a contrary direction, but then it was in circumstances which I now think ought to have forbade the operation; Where there was disease of the lymphatic glands, of the axilla, and a tract of indurated cellular membrane, reaching from the mamma to the axilla, I made the incision in a direction leading to the axilla, and dissecting out the lower part of the breast, I continued to dissect upwards until the mamma and indurated glands were taken away in one piece, or in a string of tubercles.

When the breast is taken out, we must carefully feel the surrounding cellular membrane, that no hardness or little tubercles be left. The consulting surgeon, also, should convince himself that all is taken away.

We must also examine well the extirpated tumour, and see that there are no surfaces indicating that a diseased part has been cut through, and part left behind. And knowing that the strong white bands intersecting the tumour form a peculiar character of carcinoma *, we must see that they lose themselves gradually in the tumour, and that they have not been cut through.

If we find that the tumour adheres to the pectoral muscle, the fibres of the muscle must be cut,

* The best account of the appearance of the scirrhus, as seen on dissection, is in Sir Everard Home's book, p. 156.

and part taken with the tumour. This is an unpleasant occurrence, as it implies the advanced progress of the disease.

There is no operation in surgery, says Sir E. Home, in which secondary bleedings so frequently occur, as in the extirpation of the breast. This is occasioned by our leaving the vessels bleeding until the operation be entirely finished; or from the practice I have recommended, viz. that the assistant should place his finger on the orifice, and allow the surgeon to proceed in his operation: for this occasions the arteries to be buried in the cellular membrane, so that the bleeding is stopt, though the vessel be large enough to bleed when the woman has recovered from her dread, and is laid warm in bed. But there is no alternative; for if we allow these vessels to bleed and exhaust themselves, during the operation, (besides occasioning hurry during the operation,) it produces such a loss of blood and faintness, that many vessels stop and lie concealed, that will certainly bleed when the patient is laid in bed. When the assistant, therefore, has got his finger on one or two arteries, and a third springs, the surgeon should stop, and all three should be taken up. Indeed the surgeon ought to be able to say when an artery throws out its blood, whether it will require the ligature or not; and, if it does, it is better to take it up during the operation: by which means every thing is done deliberately, and the patient's strength is saved.

OF THE CUTTING OUT OF THE GLANDS OF THE AXILLA.

I BELIEVE that the glands of the axilla ought not to be cut out, or at least, that we cannot expect good to result from cutting out a tumour formed of a diseased cluster of these glands. Notwithstanding, I permit the following observations to remain in this edition: —

When the glands of the axilla are much enlarged and deep, it is a more difficult and dangerous operation to take them out, than the excision of the breast.

I have seen a surgeon cut amongst the glands, and then find himself puzzled to discover how they had escaped him, and unable to distinguish which were the glands that he had intended to cut out. Therefore, when these glands are small and loose, but have become very hard, and have not yet condensed the surrounding cellular membrane, I would have the surgeon to examine well previously; then fix them betwixt his fore and middle finger, pressed upon the side of the chest; then cut down upon the glands, and before the fingers of the left hand are raised, put the dissecting-hook fairly through them, and pull them out.

But this is a trifling operation compared with the dissection of the deep indurated and clustered tumour of the axillary glands. In this case, the tumour should be dissected to little more than the extent of its outward hemisphere, and then insulated by working with the fingers; around the stringy shreds and vessels by which it is still held, a liga-

 ture

ture is to be put, and the glands cut off; or taking hold of this root with a pair of strong forceps, so as to resist with them, the tumour is to be pulled away: if this be dexterously done, the tumour does not bleed, and the parts heal very quickly.

It is recommended to use the needle here: to pass a needle and double ligature through the fat and cellular substance, immediately beyond the glands, and then to cut them off.

I fancy it is when the arteries have been cut across, and have shrunk into the axilla, that the surgeon does mischief in diving for them with the needle. I have known the ulnar nerve included in the ligature, by the surgeon diving at random in the axilla.

Though it be unpleasant to use the sponge, yet it is well to know that almost any degree of hæmorrhagy, may be suppressed by the use of the sponge and compress, as described in the Introduction. The arteries may be commanded by placing the arm by the side, after the compress is put into the arm-pit, and bandaging it down.

When there has been much loss of skin, and the lips have met with difficulty after the extirpation of the mamma, I have seen one or two ligatures used with advantage; but I am now of opinion that this practice ought not to be followed, and that it can serve no real advantage. If the arm be bound forward upon the chest, and the head be inclined a little, the adhesive straps will be quite sufficient.

Adhe-

Adhesive straps are useful not only in bringing the parts accurately together, but as a general support to them.

The wound should be put together, and a compress of soft lint held upon it lightly for some time before it is dressed; the patient raised, comforted, and assured that the operation is over: she should be made to take a little wine. If there be any arteries of importance untied, they will probably bleed now; and if with this delay and assurance they do not bleed, the dressing will secure her against the return of hæmorrhage.

The surgeon, with the towel in his hand, lays the edges of the integuments neatly together, at the same time pressing them to the side of the chest, so as to prevent all oozing under the skin. The ligatures of the vessels are brought out at the extremities of the wound. While the surgeon holds the parts properly in contact, his assistant places the adhesive straps (which should be about an inch in breadth) at the distance of a quarter of an inch from each other. The strap should be placed on one side of the wound first, and then the surgeon putting it down over the lips with the point of his finger, the assistant fixes it in all its length. The edges of the skin, in this manner, will be prevented from turning in.

After this, some strips of soft lint are laid along the edges of the wound, and a large soft compress is put over the whole. Let the surgeon be attentive in laying the lips of the wound, and keeping the flaps of skin close, and equally pressed to the pec-

pectoral muscle. A broad roller of flannel is put about the chest, and the one end of a split cloth being sewed to it behind, the other extremities are brought over the shoulders and pinned to the roller before.

The most unpleasant part of my duty remains, to express my frequent disappointment, and my very moderate expectation of absolute success, and entire eradication of the disease, from this operation, whenever there has been a confirmed cancer of the breast.

When it is going wrong again, hardness or pimples form on the edge of the incision, and tumour arises in the cicatrix, or in the axilla, or there begins a hardness in the pectoral muscle under the cicatrix, or the glands about the bottom of the neck get diseased. Perhaps at the distance of a year we find the pulse slow—the face become of a leaden hue, instead of the colour of health, or there is hectic flush—the eye is dull—the lips dry—there are pains over the body—and often there is an excruciating pain of the loins—or the breathing is affected and there is a short cough—or while the general health sinks, the stomach retains no nourishment, and there is incessant sickness and belching.

HINTS ON THE OPERATIONS FOR THE EXTIRPATION OF TUMOURS.

Tumours of glands are cut out, as being likely to propagate a malignant disease; as apt to in-

crease

crease and press upon important parts as the eye, or throat; or lastly, from the deformity they produce.

Before we think of using the knife, we must consider well whether the tumour be simply scirrhous, or if it be of the nature of a carcinoma; or whether a capsule has been formed which marks the limit of the diseased action, or if the surrounding parts be assimulated into the disease. In carcinoma, a disposition exists in the surrounding parts prior to the actual occurrence of disease in them. The truer statement I fancy to be, that long before the eye can discover diseased texture in the substance, the action is propagated which must necessarily precede this effect. This remark is ratified by daily experience, and has led to the following rule of practice; that a surgeon ought not to be contented with removing merely the indurated, or actually diseased part, but that he should take away some portion of the surrounding substance.

It is particularly necessary to examine the edges of a tumour which has been cut out, and to see that there is none of the peculiar texture of the tumour terminating abruptly on the edge, as if cut through. For example, the character of carcinoma, as exhibited on dissection, is in the condensed cellular membrane, which has a very peculiar appearance of irregular diverging streaks of a whiter colour, visible in the darker substance of the tumour; now if these membranous bands have reached into the cellular texture which has been

 left

left after the tumour is cut off, the disease will inevitably return, and grow with a rapid progress. The tumour is, therefore, to be held in a position bearing a reference to the wound, and where these bands are found to terminate abruptly, or where in the tumour there are any hardness and irregularity, or pulpy matter, or substance which does not appear of the natural texture, the corresponding part of the wound is to be examined, and the remaining diseased parts extirpated. We must ever remember, that if tumours possessing malignity are only partially extirpated, they resent the injury offered to them, and resume a worse aspect than before.

If we are to operate on a tumour which has its seat in a gland, and if it be a mere scirrhus, there is a circumstance, which if duly attended to, will greatly facilitate its extirpation; whilst the body of the gland is hardening, the surrounding membrane is condensed. The pressure, and probably the slight inflammation, forms the cellular membrane into a distinct capsule. By bearing in mind that these hard scirrhous tumours are surrounded by a membrane, we are enabled to cut out a tumour from a dangerous depth.

I shall suppose that a patient comes to my reader with a hard tumour under the angle of the jaw, and which threatens to push towards the throat. The surgeon calculates the place of the arteries. He presses the root of the veins, and when they swell, he sees which are in his way. He then moves the tumour to ascertain whether its roots be deep, or if it has any firm adhesion; in doing

this,

this, he relaxes the muscles, and especially the platysma myoides.

If the tumour has not encroached on the great vessels too much, if it has not adhered, and communicated its bad influence to the surrounding parts, it may be extirpated. But my experience prompts me to say here, in the most confident manner, that if the tumour be not sufficiently free in its attachments, but on the contrary, has pushed deep, and taken attachment to the jaw, or transverse processes of the cervical vertebræ, no good will come of the operation. The patient after suffering considerable risk, and being the subject of a most painful operation, will have the mortification of finding the part grow hard soon after the cicatrization, and increase in its growth with a rapidity, which the progress of the tumour before the operation shall not have led him to expect.

If it shall be determined to attempt the extirpation of an indurated and scirrhous gland, seated among large blood vessels, the surgeon has to provide himself with knives, and a strong hook, and a blunt hook for the assistant, with tenacula, and needles; but above all, with pieces of sponge having ligatures attached to them; and with adhesive straps, and a graduated compress and bandage.

He begins his operation by cutting so that the fibres of the platysma myoides are cut across. To do this, it is not necessary that he carries the incision across the neck, for in that case he would open veins needlessly; but I mean to warn the

 young

young surgeon against cutting betwixt two of the fasciculi of the fibres of that muscle by which he will find himself restrained, in a most distressing manner, in the prosecution of the dissection around the base of the tumour. The first incision being made through the skin, I have seen the operator begin his sweeping cuts round the tumour, forgetful of the cutaneous muscle of the neck; and forgetful too of that essential circumstance, that the gland is now surrounded with a proper capsule.

If he begins to dissect round the gland before he has cut down to it, he will find himself in much confusion; and vessels bleeding in the progress of his operation which ought not to have been cut. He has therefore to lay back this cutaneous muscle freely, and then he will find himself rewarded for his decision by the gland starting more forward, and becoming, in fact, more superficial.

But still he has not exposed the proper surface of the gland; if he cuts perpendicularly on the cellular coat which covers the tumour, he discovers that this cellular substance is a loose capsule, from which the gland can be turned out with the point of the thumb! with the handle of the knife he separates the capsule from the gland:—he finds a part where there is more resistance; a stronger union betwixt the gland and capsule by a cellular cord; in this he will find the principal artery which supplies the tumour; and when he cuts this tag across, he must be prepared to take up the vessel with the tenaculum.

In

In our dissections, every day we see, that the lymphatic glands have one principal ramification of a neighbouring artery running into their substance. It is this same artery, which by its activity enlarges the gland; and this artery, for the most part, is all a surgeon has to take up in the extirpation of the gland.

If the operator is ignorant of this way of forcing the diseased gland from its capsule, or has to operate upon a tumour which has no such capsule, his dissection is more tedious and difficult; and much more blood must be lost. If I am certain that a gland has this capsule, I care not how deep it may be seated; I know that I can extract it; but if it be of a different nature, and assimulated to the surrounding substance, I am unwilling to attempt the operation, because I have no guide to show me the extent of the disease; and because it happens, that at every touch of the knife a vessel bleeds.

If we have to extirpate a tumour of the nature of a bleeding fungus, like that described by Mr. Hey, or Mr. John Bell, we shall find no capsule formed by the condensed cellular substance. We must look well to the extent of the disease before we begin the operation; for it is not likely that we shall be able to mark the extent of the diseased substance during the operation. We must here too be aware that the disease does sometimes extend further than the diseased appearance; and we must therefore cut the surrounding parts freely if it be possible or safe. Where the smallest speck of tortuous vessels of the

the skin remains behind, after the amputation of that tumour called aneurism by anastomosis, the tumour is quickly reproduced with an increased exuberance. If the tumour has been seated in the neighbourhood of a bone and has fixed upon it, though there be no appearance of disease in the bone apparent during the operation, yet from that source will the disease be reproduced and propagated.

I have so often seen bloody and painful operations performed on these tumours without any good finally resulting from it, that I beg of my reader not to undertake the extirpation of them unless he be resolved at all hazards to take all away that is tainted with the disease.

In operating on these vascular tumours we must keep wide of their confines for another reason, to avoid blood, and the confusion resulting from it. If an adventurous young surgeon cuts into the body of a tumour of tortuous veins and arteries, he has vessels throwing out their blood over both his shoulders, and his attempts to tie these vessels are quite unavailing. But if he keeps wide of the diseased mass he makes his dissection in the common cellular membrane, and perhaps only cuts across one artery, which throws out its blood with no uncommon velocity, although sufficient to supply vessels with blood much more active than itself. I shall not stop to reason on this but state it as a fact worthy of the surgeon's attention.

In operating on sacculated tumours, as we have understood that the sac is the source of the secreted

creted contents, it is evident that we must cut out the sac altogether, or we shall not eradicate the disease. If there be room enough, incysted tumours ought to be cut out intire. It may happen, however, that they are situated in the orbit, and pressing on the eyeball, in which case after the integuments are dissected, as the knife cannot be pushed by the side of the tumour, let it be punctured, which will give us room to proceed.

The atheromatous tumours will sometimes burst of themselves and discharge their contents, and heal. This circumstance may tempt the surgeon, on some occasion, to puncture and press out the fluid from these tumours, and perhaps it may happen that after this only a fluid like the original matter of the cyst be discharged from time to time: but the greater probability is that an irritable fungus rises from the opening. So we shall find that an imperfect operation on one of these wens, where a part of the cyst is left, is followed by inflammation, when if the disease had been extirpated the inflammation would have quickly subsided.

These incysted tumours, are cut off for the most part on account of their size merely, but they do sometimes burst and push out a fungus, and become a source of irritation and erysipelatous inflammation; nay, the erysipelatous inflammation from such a source has spread and sloughed, and the derangement of the constitution been such as to destroy the patient: on this account therefore are they to be extirpated. I may here notice further that if we find that a fungus tumour has arisen

arisen from a wen or incysted tumour, it is an encouragement to operate upon it. We hope that the deeper part of the tumour is still separated from the surrounding parts by the remaining cyst, and prevented from incorporating with them.

An incysted tumour may be so situated that it cannot be cut out, and yet something must be done to free the neighbouring parts from the pressure of it. I do not speak of the incysted tumours, the atheroma and steatoma, but of such sacs of fluid as we may see about the tongue and throat, and which are imagined, but without any very direct proof, to be salivary tumours. These cysts ought to be freely opened. When punctured they inflame and thicken, and yet do not close altogether; even the seton does not obliterate their cavities, and when they are inflamed and yet are not obliterated, the sac thickens and becomes itself like a tumour.

In the scheme of tumours I have mentioned under the head of incysted tumours, those containing *blood*. It is not always possible to distinguish these tumours of blood from such as have a proper secretion within the cyst, yet when they have no stool or firm sac, when by continued pressure we can empty them in a considerable degree, I am inclined to conclude that there is fluid blood contained in the tumour. These tumours are soft, colourless, and as I have said compressible, and have no pulsation, and are very slow in their growth.

These

These tumours soft, compressible, and without discoloration, I have seen on the side of the neck. I have contemplated the dismay of a surgeon on opening such a tumour with the lancet, when he found pure blood flowing from a tumour over the carotid artery! But there is nothing alarming in it; they can be compressed.

The practice I would recommend in such a case, would be this. Having proved that you can command the blood from one puncture, puncture and express the blood, and puncture it again and again in several places, then use compression. It may naturally be asked, why puncture to discharge the blood when it can be pressed from the tumour without this? I propose puncturing not to discharge the blood, but to let it escape from the cells in which it is contained into the common cellular membrane, and to inflame the tumour, by which alone we can expect the consolidation of it, and the destruction of the cellular structure which receives and gives out the blood.

I hope I need not again put my reader on his guard, to warn him against such interference as I here recommend in cases of such vascular and bloody tumours as are described under the term aneurism by anastomosis, or tumours of blood where there is pulsation or discoloured skin, or tortuous veins. These, if touched at all, must be totally extirpated.

On this last subject of tumours of the skin with discoloration and tortuous veins, I have just to mention, that when at any time they shew a disposition

position to greater activity, by a wet bandage, by keeping a spongy cloth perpetually wet over them, their tendency to increase may be checked.

Of a tumour forming in a nerve. I have given a plate of a tumour in a nerve, which by the continued pain it gave wore out the patient's health and destroyed him at last. I know not whether to consider this as a tumour of the nerve properly, or only as a diseased growth in the interstice of the nervous filaments. However that may be, I consider it as very necessary to call my reader's attention to the symptoms of this disease, and further to intreat him to attend to the course and affections of the nerves somewhat more than is usual, being convinced that by this he may be able to detect the nature or seat of disease when otherwise it will be impossible. It was but the other evening that a gentleman complained to me of a pain and numbness of the back of the thumb and fore-finger, this I found referrable to a disease of the elbow-joint, and an affection of the muscular spinal nerve. I visited a woman with a disease of the womb, who complained of an unusual pain and frequent spasms of the legs. I imagined that the disease had involved the sacro-ischiatic nerve, and found it so on dissection; in the same manner I have found suppuration near the thyroid hole of the pelvis, attended with pain on the inside of the thigh and knee. So we ascertain the seat of the disease to be in the loins from the numbness of the thigh, and retraction of the testicle; and further from the knowledge of the peculiar

peculiar nature of the pain from the injury of a nerve, I have been able to ascertain that a disease of the arm did not proceed from the injury of the nerve, when others thought it so evident that they sought to cut the nerve across. In wounds too we shall often be able to ascertain the precise track of the ball, and the very artery wounded, by attending to the loss of sense of certain parts. If a ball has made its track through the axilla I consult the sensation of the finger and arm, to tell me where it has passed; and so indeed of the wounds of the pelvis, something definite may be learned when we find that parts are rendered insensible which are supplied by the anterior middle or great posterior nerve.

If my reader asks how such a representation of the necessity of attending to the distribution of the nerves comes into this place, my apology is in the following case, which drew my attention to the subject.

About three years before I saw the subject of the following case, he had fallen from the side of a ship. It happened in this way. Seeing his fellow workman falling, he threw himself forward to break his fall, and succeeded, but in doing this he fell himself; for he was caught by the ham on a projecting bolt in the side of the ship over which he turned, and hung suspended. He suffered much from the bruise on the back of the thigh, but in a short time it got entirely well.

Some time after this he began to be much troubled with a pain in his foot. This pain was in

a part

a part not likely to procure him much sympathy, and he suffered much and long without attempting to procure assistance, or only such as the extremity of pain will put a man upon for the time.

But the pain continued to increase from day to day, until it totally unfitted him for labour, exhausting and wasting his frame by continued watching. This pain was of a peculiar kind, it was confined to the bottom of the foot, and was like an intense burning, while there was not the slightest discoloration or swelling in the place. Often he would rise at night from his bed and stand on the cold stones, or plunge his foot into warm water or cold water, or to both alternately.

He now sought relief in a public hospital, and the attendants there disconcerted with the strangeness of the symptom, which they did not comprehend, put him, as is usual on such occasions on a course of mercury; but this trial of a medicine did no good, and he went home. But still suffering continually he was induced after a lapse of some months to return to the hospital, and was again put on a more severe and a longer continued course of mercury than at first. By the time this was over he had suffered continually for two years, and was reduced to a skeleton, and he was far gone in hectic.

When I saw him, he gave me this account, and then continued to complain of the extreme pain in the sole of his foot. He told me too that he had a strange numbness of the leg when he sat down. On

 examining

examining into this circumstance which I thought would lead to some explanation of the more prominent symptom, I found a tumour in the ham which when pressed gave no particular pain, but rather a sense of prickling numbness down the leg. The tumour was to the feeling of a bony hardness. I conjectured that there was some tumour pressing and wedging upon the popliteal nerve, and that this injury to the nerve in its course was referable by the patient's feelings to the extremity and final distribution of the nerve. I thought of an operation, yet I was deterred from it by the dying state of the poor man, who now suffered but indirectly from the disease of the leg, and in all probability death was no longer to be avoided by the removal of the original cause. I thought that he might be brought round so as to gain some strength, but within the week he died.

DISSECTION. On dissecting the limb I found a tumour under the fascia and about three inches higher than the usual place of the popliteal aneurism. I found some nerves running over it of a remarkably pure whiteness. On tracing the sacro-isciatic nerve I found it enter into the substance of the tumour; but on more careful observation I observed that the Peroneal or Fibular nerve, though close on the tumour, was not incorporated with it; but that the Tibial nerve, as is expressed in the plate, was incorporated with the tumour. On making a section of the tumour it had much the appearance of a large ganglion on the tibial nerve; the fasciculi of the nerve could be traced

 only

only a little way into its substance, and in the interstices of the fasciculated bands a vascular fatty substance could be observed, which resembled marrow.

I think it is impossible to mistake the nature of this case. I have no doubt that the injury received on the ham was the cause of the disease in the nerve. This however might be a mere coincidence. Yet I think we cannot close our eyes to the striking proof of the affection of a nerve in its course being referable to its extremity. Had the nature of this disease been understood earlier, I have little doubt but that cutting across the portion of the popliteal nerve which forms the tibial nerve, or the total extirpation of the tumour would have been succeeded by the perfect relief and recovery of the patient.

OF POLYPUS OF THE NOSE.

There is considerable variety in the nature of the tumours which arise from the membrane of the cavities of the face and nose. Some are harmless; some destructive in consequence of their growth merely, others are more distinctly cancerous.

The *first* kind of tumour is more of a general tumefaction of the Schneiderian membrane. It has little more unpleasant consequence than what proceeds from a swelling and fulness of the membrane. The colour of these polypi is greyish, like the mucus of the passages: they are quite soft, and not possessed of much sensibility, and

they swell with every accession of cold, or even with the increased moisture of the atmosphere.

When we operate upon this kind of polypus, though it seem to fill up the passages of the nose intirely; yet, without bringing any thing away, it vanishes under the forceps, or nothing but a few thin shreds of membrane and blood are brought away. The nostril is cleared, the patient feels relieved, and the air can be drawn through the nostril. But in a few days the disease is just in its former state, and the patient thinks the tumour has fallen forward again; though a second time grasped at with the forceps, we find nothing betwixt their blades.

This is the kind of polypus in which bougies and medicaments can be of service; because, to raise sufficient inflammation in the membranes, is to destroy this tendency to relaxation. But by mechanical pressure bougies can do no good. They deceive the patient into a belief and sensation that the passages are freed when they are occasionally withdrawn: but they press unequally on the projecting spongy bones or septum, and by altogether destroying the membranes where they press, they at last make the bones carious.

By perseveringly pulling away these loose polypi, I have found the tendency to their regeneration checked. I suppose the consequent inflammation changed the tendency of the membrane to disease. The polypi could not in any other sense be said to be eradicated.

 The

The more dangerous polypi of the nose are firmer and more fleshy, of a red or dark colour, and bleed when rudely touched. They are more permanent; less liable to swell and subside by slight colds or vicissitudes of the weather. This polypus I have found, by dissection, arising from all parts of the cavity—from the lower spongy bone—from the ethmoid bone—from the antrum maxillare. It is a disease common to all the mucous membrane. I do not believe that it can arise in consequenceof the mechanical injury of the parts: for the root arises from a part removed from the possibility of the finger causing it. And when at any time a polypus actually exists, we observe a general disposition in the membrane to form these tumours.

These polypi grow in distinct lobes; each tumour hanging from its stalk, consists of many lesser lobes; and these lobes (according to their position and their freedom to expand) enlarge successively, so that, hydra-like, when one head is cut off, (which the surgeon conceives to be the whole tumour,) in a very short time its place seems to be occupied by another.

This shews how much these tumours are restrained in their growth and expansion, and teaches us the cause of their more terrible consequences: for when they are firm in their nature, and still increasing, they press upon the bones of the face, enlarge the cavities, distort and disfigure the countenance. But worse than this, the same pressure on the bones at last destroys the membranes; is

attended with a fœtid discharge, as from rotten bones; and makes the soft bones really carious.

Or, again, they produce terrible and frequent hæmorrhages. For as these tumours shoot backwards by the posterior nostrils, or push from the antrum, their veins are compressed near their roots—their arteries continue their action—and the blood flows uninterruptedly from them, until the system is drained. Successive attacks bring on great weakness, and in the end prove fatal.

I have no hesitation in saying, that these tumours ought to be taken away as well as the looser and more membranous polypi; for in the end, they are fatal by successive bleedings, or by pressing upon and destroying the bones of the face.

If surgeons make no distinction in polypi, they may, I conceive, commit very great mistakes. For the looser tumour, the polypus forceps is best; and, by what I have seen of its use, little delicacy is observed in its application, membranes and bones being promiscuously brought away. Nay, some of our London surgeons seem to think they have not done enough until the bones are brought away as a trophy, and a proof that they have gone to the root of the evil, and have eradicated the disease. When this has a good effect, I have already said that I conceive it is by inducing a new action, and bringing on an inflammation, to destroy this unnatural relaxation in the membrane.

But the disease is not in the bones, and it is much easier to bring the bones away than the membranes; and the bringing away of the lower or

upper turbinated bone, is no proof of the membrane being brought away, far less of the roots of the tumour being removed. This practice may do well where the tumour is of a soft and membranous nature; but when it is firm and fibrous at the roots, as I have seen it; and when it has run its connexions up among the delicate laminæ of the æthmoid bone, the tearing away of the tumour may be fatal, by breaking up the cribriform plate.

I am unwilling to let this rest on conjecture. The following instance, which I saw a few years ago, confirms the danger of pulling polypi rudely away. It is evident, that a spectator can judge only from the circumstances of the case, and the motions of the surgeon's hand. The polypus forceps were in this instance buried three inches in a direction obliquely upwards; nothing was brought away but blood and loose membranes, and bones: the nostrils were, however, cleared. There succeeded to the operation, pain in the face, headache, and fever. On the fourth day, the patient became insensible, and died on the sixth day. During dissection, there was observed an effusion of coagulable lymph on the lower surface of the anterior and middle lobes of the brain, and the cribriform plate of the æthmoid bone was away; Now, I do not say that the horizontal plate of the æthmoid bone was torn away by the forceps; but from the circumstances of this case, I take occasion to say, that whether there was disease here, and the bones were eroded; or whether the bones taken

away

away during the operation, consisted of the cribriform plate, as well as the perpendicular plates of the æthmoid bone, there is good reason for avoiding violence with forceps directed upwards into the nose.

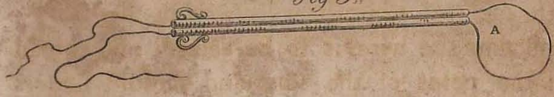
When a polypous tumour is growing in the nose, let it increase while harmless, whilst it does not press upon the bones to the effect of occasioning a fœtid discharge, or dangerous hæmorrhagy, that is, until it becomes pendulous into the fauces. Then it can be noosed with perfect effect, and with little trouble. But any operation with the wire or ligature, before the tumour has become thus pendulous, is very troublesome and not effectual: for if the tumour be caught, it is but in part; and before that which is included in the ligature has dropt off, other portions will be ready to take its place. Before it has arrived at this state of pendulous enlargement, the forceps are our only resource.

But some years ago, I found this tearing of the membrane of the nose, productive of pain and hæmorrhages so great, compared with the advantage gained, that I resolved to persevere in a less painful and troublesome way. I made a slender pair of steel forceps, with teeth to shut close; but the handles I made to separate from the blades, just behind the hinge: with this instrument I grasped the root of the tumours in the nostrils, and then with a screw, fixed them together, and withdrew the handles, fig. 1.

Fig 1.

Fig 2.d

Fig 3.d



I freed the nostrils intirely, in a few days, of the polypi, without pain or inconvenience; I fixed the instrument for one night, and on the following day introducing the handles, and twisting the tumour off, I brought it or its membranes away without hæmorrhagy. By persevering in this way, a young woman got entirely well; whereas, had I wrought and twisted the tumours and bones away, hæmorrhagy, a necessity of using plugs, and fœtid discharge would have been the inevitable consequence.

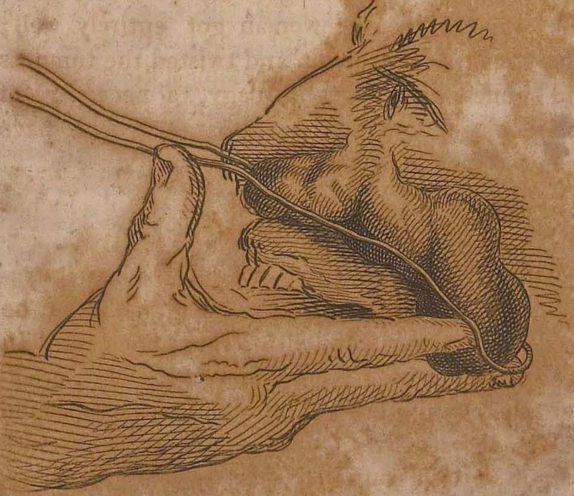
OF TYING THE POLYPI.

THE small double canula, fig. 3, is the best instrument for noosing a polypus; or a single tube may be used; or a strong wire, with a ring at one end. In the country, a blow-pipe, a female catheter, or silver tube of any kind will serve. The noose should be made of silver wire; or silver wire, with catgut twisted round it, as by twisting the tubes, the wire may break.

Having

Having given such a bend to the wire, that when passed along the floor of the nostril, it may turn down behind the velum palati, it is introduced into the nostril of the side diseased; and when it appears in the throat, it is taken hold of by forceps, or a blunt hook, and pulled through into the mouth.

And now the wire is to be seized, and spread upon the point of the fore and middle fingers of the right hand: then thrusting the wire back into the throat, the fingers are pushed beyond the pendulous tumour, and hooked up behind it; and by gently pulling on the wire at the nose, with the left hand, the noose is carried quite over the tumour, as I have here represented; It is then to be pulled up close to its root.



In the next place, the ends of the wire are put into the tubes of the double canula, and the instrument passed along until it pushes against the fore part of the root of the tumour, and has drawn the noose of the wire or ligature tight round the root. It is then fixed by twisting the wire about the wings of the nearer end of the instrument.

If the polypus is large, there is no difficulty; but this is an operation that must be done quickly. The patient's breathing is suspended, and his eyes are pushed out, and the face is turgid, while the surgeon is grappling with the tumour. There is a kind of dextrous boldness required in the operation. I have seen many surgeons of good experience and sound judgment, fail in it.

On the second and every succeeding day, the noose is to be drawn tighter, until the root of the tumour being cut through, the instrument comes away. Sometimes the tumour falling into the throat, it is thrown into the mouth. Sometimes it has been swallowed. Often it fades and wastes, and does not fall off like a distinct tumour.

I have seen a timid surgeon leave the wire bent up against the nostril until it cut it up!

When polypi, of a firm texture, are neglected, and, growing, press into the cells of the nose, they produce dreadful pain, destroy the bones, occasion a fœtid discharge, like an ozæna, which unavoidably drops into the fauces, and is swallowed; and this is followed by wasting diarrhœa.

Before the destruction of the bones is completed, the patients often die exhausted by frequent

quent hæmorrhages, continued pain and diarrhœa.

Whilst I say that polypi, which would otherwise be benign, are yet attended with these dangerous consequences, from their mere growth and consequent pressure on the unequal surface of the spongy bones, I do not mean to say that there are not tumours here, or rather diseases of the membrane, of a much more dangerous nature; of a disposition not merely to destroy the bones by pressure, but by an assimilative action to involve them in disease, and to destroy them by ulceration.

These polypi, according to Mr. Pott, begin with pain in the forehead and upper part of the nose,—they are painful to the touch,—they are hard,—and, when pressed, produce pain in the corner of the eye and forehead. He speaks also of the adhesion of their pendulous parts, which I really believe never happens. They may have more extensive roots, but do not adhere any where else. I have dissected the membrane of the nose in all stages of disease, from the simple colourless enlargement of the pendulous membranes, to those in which the ethmoid bones were entirely destroyed; and I have never seen an adhesion of the polypus to a contiguous surface. That a disease like cancer will follow polypus, and that the polypus will vanish whilst the horrible disease has made its way into the brain itself, I know from dissection. But I do not think that Mr. Pott has given the true distinction of the benign and cancerous polypus.

There

There are some little contrivances in instruments which almost every surgeon will have made after his own method. The best, perhaps, are those represented above.

The instrument 2, p. 168, is a simple rod of silver, with an eye at one end, A, and a cleft at the other, B. The cord or wire is doubled, and put through the eye; the ends, when drawn tight, are fixed into the cleft.—The double canula, 3, is the instrument used by Levret. The noose, A, is made by putting the ends of the wire into the canula; and when it is drawn tight they are fixed about the rings of the instrument.

Still in adapting the noose to the neck of the tumour, an instrument is wanted with which we can take hold of the cord or wire, and direct its application. The instrument 3 (see Polypus of the Womb,) is used for this purpose; but the better assistant is a small pair of forceps, which we can manage easily; they catch hold of the ligature or wire, which still running loose in the points of the forceps, can be directed and made to encircle the base of the tumour.

In regard to the cutting off polypus with the knife, it is doing nothing. It is dangerous, inasmuch as the hæmorrhage will be great, and require the stuffing of the passages, and it will not be effectual in the removal of the disease. Besides there never is occasion to use the knife. There is no tumour but an osseous one which will resist the right application of the cord, or lace, or wire, and it is always possible to noose the tumour.

Mr.

Mr. Whately attempted to cut through the tumour by casting a cord over it, and drawing the ends of the cord alternately, so as to saw it through. This failed: but I cannot recommend the practice of cutting either with the bistory or the cord. Suppose that the tumour should be half cut through in this way, and any interruption occurs to its completion, the hæmorrhagy will be very great, and the tumour still hanging in the throat, we cannot plug up the nostrils in a way to stem the blood. I must further observe, that I conceive, although the tumour hangs from the posterior nostril, and is seen in the throat, its roots cannot be seized by the forceps introduced into the mouth, for they spring from the sides of the cavities of the nose.

The tumour has been sometimes so long that it has hung into the fauces and œsophagus, and has only been occasionally thrown forward into the mouth by the action of vomiting. When this is the case, it is difficult to throw the noose under the lobes of the tumour without considerable dexterity. The patient is made to vomit up the tumour, and then the noose is thrust behind it.

POLYPUS OF THE EAR.

The usual way of relieving this complaint, is by tearing the tumour away with forceps. This may endanger the membrane of the tympanum. The better way is to crush and destroy them with small forceps, which are to remain in the passage of the ear

ear until the tumours waste under their pressure. The forceps will be of the kind represented, p. 168.

But when with the probe we can ascertain that these tumours do not extend their roots to the membrane, they may be torn away at once.

Of tumours in the rectum, see Vol. I. p. 355., and of hæmorrhoids, see p. 361.

OF POLYPUS OF THE VAGINA.

The polypous tumour of the vagina almost always proceeds from the uterus. Tumours grow from the vagina itself, and are troublesome or dangerous from their bleeding: but the more common occurrence is a tumour in the vagina, appended to the uterus. This is a subject of considerable importance. A young surgeon, when he finds a tumour in the vagina, must not immediately think of his operation: there is much to be studied in the symptoms, and some difficulty occurs in ascertaining the nature of the disease, by the finger and probe.

All excitement of the womb is attended with increased vascularity and muscularity. Polypous tumours do not grow without exciting a certain growth in the uterus; and with this enlargement and excited state of the vessels, the periodical discharges are increased, so that the disease is often mistaken for menorrhagia.

A polypus is a disease of slow progress; and it will give distress long before the patient is sensible

of

of its nature, and before it becomes perceptible to the feeling. The health is not perfect; there are complaints the effect of uterine irritation; pain or uneasiness, and weakness of the loins; increased mucous discharge; the menses are profuse and irregular, and painful, so that the patient is often greatly reduced, and the complaint is mistaken for a disease of weakness, and medicines or regimen are ineffectually prescribed. When the local disease baffles all such general remedies, many are by ignorance or neglect brought to the lowest state of weakness. Many a poor timid woman dies of this disease, when a very simple operation would give perfect relief.

With the return of hæmorrhagy, there is a pain and bearing down like labour-pains. In fact, the muscular power of the uterus increases with its excitement; and often it happens that the tumour originally seated in and growing from the uterus is suddenly delivered from it, and lies in the vagina. By the stricture of the womb, the vessels of the tumour are made more turgid, and the hæmorrhagy is more profuse. In some rare instances, the polypus thus embraced by the neck of the uterus, has faded, and dropped off.

When an examination is obtained, the tumour is felt presenting in the vagina, or pullulating from the orifice of the womb. There is a possibility of a very serious mistake here. The prolapsus of the womb is a more frequent disease than the polypus; and it must be recollected, that prolapsus and inversio uteri have been mistaken for this disease of polypus,

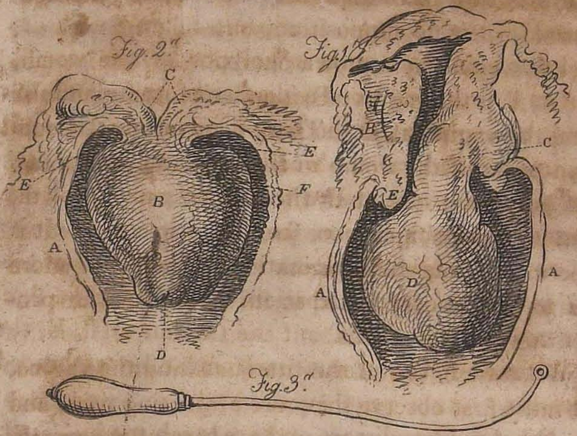
polypus, and the womb itself included in the ligature!

I know no distinction in polypus of the womb, but as it proceeds from a disease of the glandular neck and orifice of the womb, or from the substance and body of the womb. In the latter case, the polypus is attended with a more rapid growth, more irritation, and more profuse discharge. It is also more dangerous in its extirpation, and more apt to have incorporated in its substance the proper body of the uterus.

When we have felt the tumour filling the vagina, we must first observe the more projecting part, and see if we cannot recognise the orifice of the womb, though distorted, as it often is when there is a procidentia or prolapsus. We must push the fingers to the root of the tumour. If we find that it has a narrow neck, we are safe; if we find that the neck of the tumour is compressed by the orifice of the womb, we are assured that it is a polypus. But if we feel the attachment of the tumour broad, and no proper orifice of the womb, and find that we can neither push the finger nor the probe* beyond the attachment of the neck of the tumour, we must suspect that the tumour has either grown from the substance of the womb, and gradually inverted it, as I have found on dissection; or the tumour being pendulous, it has dragged down the fundus of the womb.

* There is a probe with a little ball on the end, safer and better than a common probe, for ascertaining the form and connexions of internal tumours, as those of the womb and nose: the same which I use for the urethra will answer this purpose.

These



These plans represent the distinction which I have described. In fig. 1. let A represent the vagina; B, the uterus; C, the root of the polypus, attached to the side of the uterus; D, the body of the tumour, filling the vagina. Now, if by the finger we feel the tumour pendulous, and detached all around, and can feel the orifice of the womb at E, we are assured that it is a tumour hanging from within the uterus. And now, by insinuating the ball of the probe into the uterus, we ascertain that the cavity is beyond the neck of the tumour; and perhaps finding that the probe catches against the side of the uterus, when we pass it upon one side of the neck of the tumour, while it passes deeper on the other, we may conclude that the polypus springs from the neck of the uterus.

But in the second figure, we see what has happened: it is no supposition, but taken from a dissection made by my own hands.

A, A, is the vagina: B, is an immense tumour, filling the vagina at D. There is no orifice: it is not a descent of the womb in the common acceptation of the term; yet at E, there is no passage for the probe; the finger can feel no orifice. We may conclude from the examination, therefore, that this is no polypus for extirpation, and that if the ligature was to be put about the tumour at E, E, the substance of the uterus itself must be embraced by it.

What did the dissection here teach me?—First, Upon looking down into the pelvis, I saw the fallopean tubes C, and the ligaments, as if sucked into the body of the uterus. But that which seemed the uterus was in fact the vagina, into which the uterus was pulled, and which enlarging there, had distended, and raised up the vagina. Upon examining this tumour, and making a cut into it, it was evidently the uterus itself; for the Fallopean tube opened at F, upon the surface of the tumour.

Now, had the ligature been applied upon this tumour, and it had every feeling of a common tumour of the polypous kind, the uterus itself would have been mortified and cut off by the operation, and the patient would have certainly died.*

* It has happened that the uterus has been, in mistake, cut off, and notwithstanding the woman has survived; but there are many proofs of the fatal effects of this mistake.

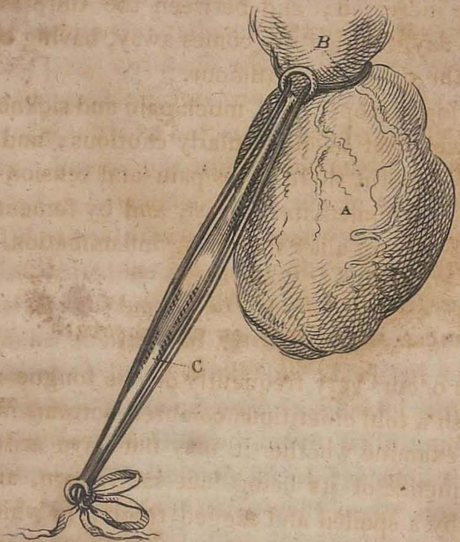
We must never forget, that by the rude examination of the polypus, the surface may be torn, and a very terrible hæmorrhagy be the consequence, to so great a degree, indeed, as to prove fatal if the patient has been much reduced previously by similar discharges.

If, however, we have ascertained that the disease is polypus, we can immediately suppress the hæmorrhage by applying the ligature.

The only instruments necessary in this operation will be, a strong ring, of that kind used for tying a cord about the tumour within the rectum, and two instruments of the kind, delineated in fig. 3., having a small ring which opens with some elasticity; so that being run along the cord which ties the tumour, it may direct it deep, and slip off from it when necessary. Placing the patient on her side, or on her back, we take a small firm cord, and without making a noose upon it, we spread the doubling of it upon the extremities of the fingers: insinuating the fingers conically into the os externum, when they touch the lower part of the tumour, expand them, and as it were grasp the tumour, carrying the cord round it at the same time upon the points of the fingers; then pushing the fingers as deep as possible, leave the ligature, and withdraw the hand.

But the ligature may still be far from being home to the neck of the tumour. We have now to take one of these curved instruments, having a ring in the end, and carry it along the ligature, and direct it to the very base of the tumour within the uterus:

uterus: then with the other ringed instrument embrace both ends of the ligature, and run it home along them, until the instrument is brought up close to that first introduced, which is now withdrawn. We may now tie the cord in the common method.



A, the tumour; B, the ligature round the neck of the tumour; C, the instrument, being a piece of steel, with a ring at each end:—one of the rings is put on both ends of the ligature, and pushed up to the neck of the tumour, so as to tighten the cord B; then the ligature is put through the nearer ring, and tied firmly at D.

This is simple and effectual. The ligature ought to be drawn so tight as to stop the circulation. If

If too slightly drawn, by only strangulating the veins, it will produce or increase the hæmorrhagy, if the surface has been injured; but when it is sufficiently tightly drawn, the bleeding will cease; on the next day the cord will be drawn a very little tighter; and each succeeding day the tightness should be increased; and between the third and the sixth day, the ligature comes away, having cut through the neck of the tumour.

If, during this operation, much pain and sickness follows, we must be particularly cautious; and if in the course of it there arises pain and tension of the belly, we immediately desist, and by fomentation and bleeding allay this rising inflammation.

ULCER AND TUMOUR ON THE TONGUE.

There occurs very frequently on the tongue an ulcer, with a foul cineritious coloured bottom. We have to examine whether it may not have arisen in consequence of its being incessantly torn, and irritated by a spoiled and ragged tooth; in which case the tooth must be drawn, or filed down and smoothed. But chiefly we must be careful to observe the connection with the stomach, for I believe this to be a frequent cause of the ulcer. This will readily be believed, when we consider the intimate sympathy betwixt the tongue and stomach, made apparent to us on many occasions; but especially by the state of the secretion of the tongue, influenced by the healthy or diseased action of the stomach.

When neither medicine nor diet have influence on the ulcer of the tongue; when it becomes painful, and the edges rise and are ragged, the ulcer may be cut out, after which the tongue quickly heals.

To do this the common tenaculum is introduced into the substance of the tongue, so as to pass under the ulcer. Then with a common scalpel, run along the convexity of the tenaculum, the diseased part together with the instrument is cut out. The tongue may be cut very freely, but let the operator be aware of the situation of the ranine arteries.

When however the disease of the tongue is deep, when excrescences with deep roots grow upon it, or when there are small firm tumours, formed in its substance, we adopt the means suggested to us by Sir Everard Home. *

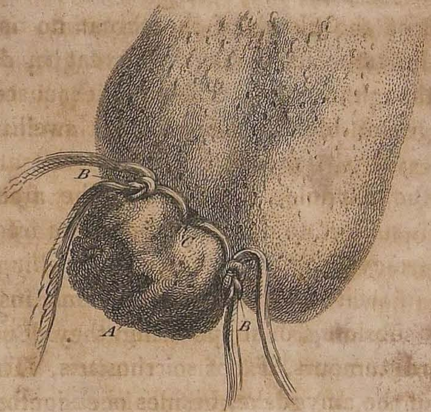
Having well examined the depth, and utmost extent of the disease, a crooked needle (drawn to the middle of the ligature) is passed through the substance of the tongue, beyond the diseased part; the middle of the ligature being cut, the needle is taken away, and the ligatures remain. There are now of course two ligatures, one of which is to be tied, in each side of the diseased part, so as totally to obstruct the circulation in the insulated portion, as is represented in the next page.

In a few days the diseased part drops off, and the surface left by this separation looks sloughy, but

* See his Observations on Cancers.

becomes

becomes soon clean, and fills up in a wonderful degree. The pain is much less than we should be led to expect. A salivation is sometimes the effect of the operation.



A, The diseased portion.
B, B, The ligatures tied.
C, The point at which the needle was passed.

OPERATION ON THE AMYGDALÆ.

In the inflammatory sore throat, these glands swell enormously, so as to produce an apprehension of suffocation. But when they suppurate fully, they burst, and the relief is perfect. In imitation of this, we have sometimes to pierce them in order to evacuate the matter. Often this does not suc-

 ceed,

ceed, that is to say, the matter is not fully evacuated. But shortly after the matter is spontaneously discharged. Perhaps this is because the matter is behind the glands, or in the duplicature of the arches of the palate. Be this as it may, deep scarifications of the glands of the throat do no harm, when the tumefaction is thus great in degree; and although the matter be not evacuated, the discharge of blood relieves the swelling and tension.

All the glandular apparatus of the mouth and throat is subject to disease; none more frequently than the amygdalæ, for often after swelling enormously in their inflammatory affections, instead of entirely subsiding, or suppurating, they degenerate into hard tumours, if not scirrhosites. These tumours of the amygdalæ, besides occasioning much inconvenience, from the difficulty of swallowing, produce a remarkable change on the voice, and require to be taken out.

These diseased glands have been violently torn away, an operation not to be imitated. The French surgeons cut them with a concealed knife, but I conceive the ligature is still preferable.

The ligature may be thrown on the tumour in the manner I have described in speaking of the operation on tumours in the rectum.

OF THE UVULA.

The uvula often hangs down relaxed, producing a feeling which the patient is most anxious to be

rid

rid of. Very simple means will often succeed in causing it to be drawn up, viz. to touch it once or twice with a little Cayenne pepper, and to use astringent gargles.

When this does not succeed, and there is a real enlargement and prolapsus, the ligature or scissars may be used to free the patient of it entirely.

SECTION XII.

OPERATIONS FOR THE DISCHARGE OF PRETERNATURAL FLUIDS, OR OF PARACENTESIS.

IN ascites, the urine is generally small in quantity, and of a deep colour, with thirst, and sensation of heat; there is a frequent pulse, and the breathing is affected; upon applying the hand on one side of the belly, and striking it with the other, there is a distinct feeling of fluctuation.

Dropsy of the peritoneum is very often an accompaniment and consequence of debility; a part of a universal dropsy. We naturally inquire, has the swelling of the belly followed an increasing anasarca, or did the swelling of the abdomen precede the anasarcous swelling of the legs? for the latter may be a consequence of the mere pressure of the former. If the anasarcous swelling of the lower extremities has become a general leucophlegmatic swelling of the body, with paleness and sallowness in the countenance, it is needless to say that the operation promises less probability of success.

If

If the habits, countenance, and present symptoms indicate disease of the liver, it is also unfavourable.

We next inquire into the origin and progress of the swelling of the belly, to ascertain whether it be an incysted dropsy or not? If the tumefaction of the belly has been generally diffused from the beginning, and there has been a general hydropic tendency with thirst, and scarcity of urine, it is ascites.

If, on the contrary, in a female a tumour rose at first circumscribed and distinct, near the groin, and gradually extended upwards and across the belly, it is not ascites. These symptoms indicate a dropsical swelling of the ovarium. Moreover, we shall probably find that the disease of the ovarium has been increasing slowly for many years. If there be no general dropsical swelling of the limbs *, and the strength, breathing, and appetite, have been little affected, the skin not dry, nor any scarcity of urine, nor thirst, the absence of these symptoms confirm the supposition that it is not dropsy of the abdominal cavity.

In dropsy of the ovarium there is often a very viscid and somewhat gelatinous fluid, which requires a larger canula to draw it off than in the dropsy of the peritoneum.

The occasion for drawing off the water of dropsical swellings of the belly is either to give temporary relief from the burden, or to assist the opera-

* In the dropsy of one of the ovaria, there is often a swelling of the thigh or leg of the same side.

tion

tion of medicines in curing the disease; for, certainly the oppressions of the heart and lungs, compressions of the viscera of the belly, and impeding of exercise of every kind, directly tend to continue that state of the system which originally produced the accumulation of the water.

We have only to consider the connexions of the diaphragm; the relation which is established betwixt the abdomen and thorax; and the effect of the due degree of tension on these cavities and upon the state of the circulation, in order to see the usefulness of compressing the belly during the evacuation of any considerable quantity of fluid.

The due compression of the belly during the discharge of the fluid ought on no account to be neglected. The abdominal muscles acting feebly, the diaphragm must be also effected. The viscera of the abdomen, and their great veins, wanting their accustomed pressure and support, the blood accumulates in the vessels. The diaphragm acting feebly, the membranes around the heart are relaxed, the heart wants support, and the blood is accumulated in its sinuses. The blood is not carried with full stream to the brain. There is a fluttering of the pulse, and a sensation of languor and faintness.

To prevent this, there is a bandage for the belly to be had in the shops; but the best support I conceive to be a piece of flannel, large enough to cover the distended belly completely, and to go twice round the body. The ends of the cloth are then cut up like a bandage, into three or four slips,

slips, leaving the middle intire. The middle part of the cloth is put upon the fore part of the belly, and the cut slips go round to the back; the surgeon's assistants take hold of these, and as the water flows, they tighten the bracing of the belly by pulling these ends. When the operation is finished, the ends of the clothes are put down over the belly, and pinned.

Where the puncture is to be made, the bandage is slit. At what part of the belly the puncture should be made, is a matter of some moment. It has been the custom to tap at that point of the belly which is at an equal distance between the umbilicus and centre of the spine of the ilium.

But the operation having been done here, a considerable branch of the epigastric artery has been struck, and the patient has died of hemorrhagy. The trunk of the artery, or its principal branches, being removed from their usual place, arises from the difference in the action of the lateral muscles of the belly, and the recti muscles. The muscles expand chiefly by the separation of their fibres, because in that direction they have less power of resisting distention. The oblique and transverse muscles resist with power, because they act in the direction of their fibres; but the recti being stretched by the lateral force, allow themselves to be expanded largely over the fore part of the belly. With them, of course, the epigastric artery is extended beyond its usual limits.

One

One reason for preferring this place in the side, for operation, is the convenience of laying the patient recumbent. But this is chiefly necessary, on account of the sickness and faintness; and by the due compression of the belly, the faintness is prevented, and the patient may be placed upright when tapt; the convenience of position therefore is an insufficient reason for operating in the side.

There is a circumstance attending the change of place, which is not enough attended to. It is the continued flowing of the water of the ascites; even days after the operation. This is very much more apt to take place when the operation is done in the linea alba, than when done in the side of the belly: and it is highly dangerous; for while the hole in the peritoneum remains open, there is danger of inflammation to the general cavity.

I never have observed this consequence to follow the tapping in the side, because then we pierce through a thickness of muscles, which swell up immediately, and close the opening. But in puncturing in the *linea alba*, where there is only firm tendons, incapable of the same quick swelling or vascular action as the fleshy fibres are, this continued oozing will follow the operation: and it has even burst out suddenly when the patient has been walking in his room, with such a subsiding of the belly, that he has fainted and fallen very low. Some prefer making the puncture in the umbilicus; but it is much thinner than the linea alba, and upon the whole, the linea alba is the place to be preferred.

The

The patient should be supported in bed, so that if there occur great faintness, he may be laid down.

If there be anasarca of the integuments of the belly, it is unpleasant to perforate so great a thickness of the integuments as may be produced by the distention of the cellular substance. But by pressure with the point of the finger this may be removed.

The trochar should have a double canula, that is, there ought to be a lesser canula closed and rounded at the extremity, having a hole in the side, which is to be introduced within the other, when any thing obstructs the flow of the water.

The surgeon takes the trochar, resting the round handle of the stilette in the palm of his hand, and reaching the fore-finger to near the point of the instrument. Having just touched the skin with the bleeding-lancet, to prevent the resistance of the tougher integuments, he pushes the instrument directly inward, the fore-finger being a guard that the point does not start suddenly forward. When the resistance has ceased, and the shoulder of the canula has passed the peritoneum, the canula is to be pushed off the stilette; this is better than withdrawing the stilette without such precaution.

When the belly is greatly distended, the walls of the belly are consequently very thin. In making a slight touch with the lancet on the skin only, as I intended, I have been surprised to see the peritoneum opened, and the water flow. The apparent thickness is, as I have already said, owing to an effusion into the cellular texture of the skin; and

and if we press out the water by resting the point of the finger upon the part where we intend to puncture, we have something more like a membrane to pierce than what we see on dissection of the abdominal muscles. When this is the case, it will be better to use a trochar with a conical point, than with a point which cuts; for the former will pierce with sufficient ease, and the hole will be more easily closed after the operation.

If the distention of the belly be very great, the slower the water is drawn off, the better; and if the patient complains of faintness, we stop the flow of the water, and lay the patient with the head lower. If the water be obstructed, we should introduce the second canula, which will push back the omentum, and permit the water to flow by the lateral hole.

When the water is entirely evacuated, and the trochar is withdrawn, and the orifice dried, the lips of the opening are simply brought close by a piece of adhesive plaster, which should be supported by a compress of lint; and over this, we bring one of the extremities of the roller, or bandage.

It is possible to mistake a tympanitic state of the intestines for ascites. I know that the operation has been several times performed, where there was no water in the belly. The feeling of the two diseases is so different, though the distinction is not to be described, that I am somewhat astonished at the fact. I believe that in some instances, a diseased state of the ovarium has been

been mistaken by the surgeon as well as the pupils. Having on two occasions, very closely following each other, seen that on the surgeon withdrawing the stilette, only a very little water flowed, and that the canula was then stopt, and that on the surgeon introducing the probe, not water, but pellicles of membrane, like the omentum, presented, I resolved, if possible, to ascertain the nature of the case; one of the patients died. I found that it was a dropsy of the ovarium, which had been considered as an ascites; and that while the distended ovarium filled the whole belly, it consisted of distinct compartments of irregular sizes, having within them shreds of loose and floating membranes. One of these cells being pierced by the trochar, after discharging a little fluid, some of the membranous-like substance had fallen before the stream, and been carried through the canula, and mistaken for the omentum.

As to ascites in women, we should recollect that there is a possibility of their being pregnant: if of an age, and in circumstances to allow of this suspicion, we should examine by the vagina before deciding on the operation.

It were better, that what has been said by some authors, of the operation of paracentesis, for air in the cavity of the abdomen, were forgotten; and as to perforating the intestines for a tympanitic state of them, it has, unquestionably, been proposed in temerity and folly.

 OF

OF PARACENTESIS THORACIS.

WATER in the chest is a much more alarming, and generally a more fatal, disease than ascites. It proceeds from a derangement of more vital parts. The operation for evacuating the fluid is done in very different circumstances from that of the tapping of the belly; and the disease itself I believe to be very different. In the belly there may be a partial debility of vessels, and disease of viscera, which may produce collections of fluid secretion into the peritoneum, without an affection of the vital parts. A disease of the liver, or a debility in the venous system of the membranous viscera, and of the larger glands, may produce the disease without the participation of the heart and lungs in the complaint; or at least a very indirect participation. In the thorax it is different. The dropsy must be preceded and accompanied by derangement in the function of the heart and lungs.

If I could convince myself that it were possible to distinguish the presence of water in the thorax as clearly as we do in the abdomen, I would then recommend that the puncture should be made with a small trochar at once into the cavity of the chest, at the point of election. But as I am not satisfied that either by symptoms, by agitating the patient, or by the means of percussion on the side of the chest, or even the distortion and change of shape of the thorax, that it is possible positively to ascertain the presence of water in the chest, I conceive we must proceed in the most cautious manner.

OPERATION.

The instrument ought to be a very small canula with a broad shoulder. It should be closed at the extremity and open on the side. The place on which the operation is to be performed is at the utmost convexity of the side, betwixt the sixth and seventh rib, and betwixt the attachments of the serratus magnus, and the obliquus descendens abdominis. Let the assistant-surgeon draw the integuments upwards. Then let the surgeon make an incision with a lancet-pointed knife of two inches in length, along the upper edge of the seventh rib; let him proceed to cut through the fibres of the intercostal muscles, until he can distinguish the pleura. He is to puncture it with the point of the knife. If now water flows out, let him introduce the canula: but if instead of the water being forced out the air enters, and the surface of the lungs separate from the pleura, he is immediately to desist, and letting the integuments fall back to their natural place, he is to close the wound so that it shall heal by the first intension. If he finds that there is water in the chest, when it is discharged the canula is to be withdrawn, and the wound healed.

A collection of purulent matter in the cavity of the chest (EMPYEMA) is formed in consequence of wounds, or of foreign bodies lodging in the thorax; and it is necessary to perform an operation for its discharge. The propriety of operating is more doubtful as a remedy for empyema when it results from inflam-

inflammation purely. Before it is thought of, there must be remission of the more acute pain, while there remains dyspnœa and cough; and to the inflammatory state, there must have succeeded rigors, fixed pain in the chest, and encreased oppression. There must be oppression and difficult breathing in the recumbent posture, and an inability of lying on the side affected. The side affected must be distinctly larger than the other; and there must be a softness and œdematous state of the skin on the whole of that side, before the operation can be thought of. It would be more satisfactory still if there is a heaving up, and separation of two of the ribs, and a distinct pointing of the matter.

The operation is the same I have already described. We cut directly on the middle of the convexity of the seventh rib, the length of two inches, then drawing the integuments upwards, so that the incision is over the intercostal muscles, we continue it through these intercostal muscles; then taking the trochar, we pierce a little obliquely over the upper edge of the sixth rib*. Or the operation is completed with the scalpel, by continuing the incision through the intercostal muscles and pleura, just so as freely to admit the matter to flow; and in this case, it will be necessary to introduce a bougie, or leaden canula, after we have made the incision. The discharge continues long, and unless the constitution be good, the patient too often sinks at last.

* The intercostal artery lies in the groove of the lower edge.

I need

I need scarcely here remind my reader, of the anatomy, and that when the chest is distended, the diaphragm is pushed down. But though this be the first effect, yet if expectoration of matter has taken place, the cavity of the chest is diminished, the diaphragm rises much higher than usual. So that I have opened a body where it was in contemplation to perform the operation for empyema, and where if the opening had been made betwixt the sixth and seventh rib, they must have cut into the abdomen, not into the chest. In the case of a second opening being necessary, when the first has closed, I should imagine the recollection of this circumstance, viz. the ready adhesion of the diaphragm to the pleura costalis, when matter has been evacuated, to be of very essential importance.

OF CHRONIC ABSCESS, AND MORE PARTICULARLY OF THE PSOAS ABSCESS.

Experience teaches us that a scrophulous abscess will seem to point, being soft and prominent, and having fluid evidently in it; and yet that when the lancet is thrust into this tumour, only a pale watery fluid escapes, and the walls of the tumour acquire an inelastic, but irregular firmness, like a cake; and the progress of the action, or at least the softening of the tumour towards the surface, is not promoted but checked. The scrophulous action is here, I suppose, of a slow and sluggish nature, and the phlegmonous

 action,

action, which is the consequence of the wound, has somewhat of a contrary tendency, so that the original progress of the disease is not promoted.

Again, in the scrophulous action about joints which has produced abscess, by cutting into this abscess the slow nature of the disease is changed; the matter, though evacuated, collects again, no longer bland or mild, but putrid and acrid, and caries may be the consequence.

It is of little importance whether the change in this particular instance is to be attributed to the air getting access to the secreted matter, and producing an alteration upon it, making it acrid and stimulating; or whether the incision changes the nature of the action in the surface of the cavity, so as to produce bad and fœtid matter. But it is particularly of consequence to observe this contrast, that by stimulating the surface and making counter irritation on such a scrophulous joint, the original action might have been changed, and the limb and patient saved; while under this surgical treatment the disease rapidly advances.

Where an abscess or extensive fistula forms, in consequence of a wound, we may be permitted to rouse the activity of the surface by an injection or seton, for perhaps there is nothing peculiar in the action; there is only a weakness and inactivity; and by habit the secretion continues. But even here it will in general be better to raise the life and activity of the whole limb, by admitting freer motion, by warm stimulant fomentation and rubefacients. For though these communications and abscesses

abscesses have formed after an injury, it by no means follows that they are merely the consequence of that injury; they have often a scrophulous origin; and the injections or seton raise a violent inflammation, and general tension of the limb, which, instead of promoting the adhesion of the cavities, form others in succession.

All abscesses or fistulæ connected with ducts or natural passages form a class by themselves, of which I have already treated. Such are fistula in ano, fistula lachrymalis, fistula in perineo. In these the difficulty of discharging the natural fluids produces an inflammation in the ducts; abscess forms by the side of the passages; and a communication is made betwixt the duct and abscess by ulceration; an irritation is thus kept up, and until the passage be free the abscess will not heal.

Where an abscess is very large, there is one circumstance requiring particular attention; if the abscess burst, that is, if the ulceration proceeds outwardly to the skin, the whole surface of the abscess will inflame, the discharge will become bad, and the patient will die. We open such abscesses, not with the intention merely of evacuating the matter, nor for the purpose of procuring an adhesion and obliteration of their sides, but to allow the cavity gradually to contract so that when it fills again it may not be so extensive, nor so apt to disorder the system when it is finally opened.

 For

For example, if a large abscess be pointing, and about to ulcerate and burst, it is to be punctured, and the matter evacuated; but it is not to be lanced just upon the most prominent and thinnest part. The opening should be made by the side of that part of the abscess where it naturally may be expected to open. The opening is thus to be made in the healthy skin, so that the wound may close again without any ulcerative action taking place, and without the risk of inflammation being propagated over the sides of the cavity. From the evacuation of the matter, and contraction of the cavity, the walls of it thicken. When the cavity fills again, it is less extensive; it is to be punctured again, and the opening immediately closed; the abscess still further contracts; and perhaps by the third or fourth opening the abscess is so much diminished that no care need be taken to close the opening; it may be left to common treatment.

I have no doubt that the bad consequence of opening an abscess proceeds from the action of ulceration being propagated from the lips of the wound to the general surface of the cavity. It is not correct to attribute the alteration which takes place to the admission of air giving liberty to chemical changes of the contained pus, for the same result follows the wound of a cavity where no pus is contained. If caustic be applied to a large abscess, and if the lancet be pushed through the eschar, and the pus evacuated, no bad consequence will follow, until the eschar loosens from the

the living surface, which being a consequence of ulceration, and the action being propagated over the cavity of the abscess, a change is wrought upon the secretion, and hectic fever follows. The best proof that the derangement of the whole cavity proceeds from the ulceration of the lips of the opening, and not from the admission of air is, that if the union of the wound can be procured without ulceration, no derangement of the abscess or of the constitution follows.

These introductory observations will be found necessary to the understanding of the short statement I am now to give of the nature of the lumbar abscess, and the treatment of it.

The Psoas Abscess is the consequence of a slow and almost imperceptible inflammation of the cellular membrane, by the side of the lumbar vertebræ, and around the psoas muscle. It is an example of the chronic abscess. These deep parts, from their nature as well as their situation, being little sensible, and the disease being a slow, scrophulous action, the nature of the complaint is only suspected when there is a weakness in the loins, a numbness and weakness of one thigh, and a dull wearying pain in the loins like rheumatism; nor are there at first general symptoms to mark the diagnosis more distinctly. Sometimes the pain in the loins is very severe, with a total inability of raising the thigh. But when a compressible tumour appears in the groin, the fluctuation is perceptible in the tumour, and percussion is felt in it when the patient coughs; then the nature of the case

case is too evident, and the surgeon has that painful conviction of a patient being in the utmost degree of danger, while he is little conscious of it himself, and but imperfectly comprehends how a matter so trifling in appearance, and so little troublesome, is pregnant with so great evil. Sometimes the matter of the lumbar abscess sinks down behind the peritoneum, until it appears by the side of the anus, which makes a much worse case than the other.

If there precedes or accompanies the appearance of abscess at the groin, a curvature of the spine, the prognosis is still more unfavourable; for caries of the bodies of the vertebræ is sometimes the origin, or at least the precursor of the psoas abscess. As might be naturally expected, especially when the disease is complicated with a caries and sinking of the spine, the abscess sometimes makes its way outward upon the loins, forming a tumour by the side of the spine.

If the tumour in the groin is opened, and the matter of the abscess evacuated, the sac inflames, the loins become weak and painful, rigors, a rapid pulse, white tongue, and hot skin succeed, the discharge becomes thin and fœtid, and often profuse, the appetite entirely fails, the nights are restless, and a rapid hectic is confirmed.

The cure is to be thus conducted: 1. To evacuate the matter and yet endeavour to prevent the inflammation of the sides of the abscess. 2. To produce a counter irritation by an artificial ulcer on the loins. 3. To correct or change the action,

or produce an absorption of the remaining matter by emetics or by electricity.

If the abscess have formed a tumour in the groin, and the fascia be yet entire, and the integuments on the prominent part of the tumour thick and not yet possessed of much increased vascularity, the abscess lancet is to be thrust into the most prominent part, a little slantingly through the skin; but if the tumour be threatening to burst, we should puncture it not on the highest part, but more towards the base of the tumour, so that the opening be made in sound skin, which will more readily close and heal.

When the pus and coagulable matter are evacuated, the wound must be treated tenderly, united by a small piece of plaster, and bound down with a soft compress and bandage. We must be careful that nothing intervenes betwixt the lips of the wound, so that the union of the skin may be secured; and by the compress the integuments are pressed upon the fascia of the thigh, so that the opening through it is closed also, and the matter of the abscess prevented from passing under the skin. The patient for a time must be confined to the horizontal posture, and use no exertion in raising himself, or in moving the abdominal muscles.

When the small wound is healed, then more freedom is allowed to him, and gradually the tumour appears again. When it has acquired a size and prominence sufficient, it is to be punctured a second time and healed; and this successively until the matter evacuated be no longer considerable,

able. When only a few ounces are evacuated, and the state of the patient is favourable, Mr. Abernethy leaves the puncture open, being no longer solicitous to prevent the inflammation of the sac; or rather it is better to endeavour to cause an absorption of the remaining matter of the sac, by giving emetics and sending the electric spark through the loins and side. If there should occur much debility during the cure, bark and wine and free air will do much; and opium with the bark will be required if there be much irritation in the sac, with diarrhœa.

Another resource for correcting the internal disease in the loins is the formation of issues by the side of the vertebræ, as for the disease of the spine; and this treatment is particularly necessary when there is a tenderness on pressing the spines of the vertebræ, or a degree of curvature of the spine accompanying the abscess.

It is to Mr. Abernethy that we are indebted for this plan of treatment of the lumbar abscess, which affords us hopes of curing a disease before considered fatal.

OF ABSCESS IN THE EAR.

The matter which flows from the ear may be a mere change of secretion in the glandulæ ceruminosæ. In this case we inject a mild astringent, as lime water, and anoint the passage with the diluted citrine ointment.

Sometimes

Sometimes the passage ulcerates, and there is a great purulent discharge from the ear, or after some occasional increase of the inflammation, an abscess or sinus forms behind the tube of the ear. The following consequences may ensue from this suppuration. 1. The thickening of the membrane of the tympanum. 2. The growth of fungous excrescences from the passage. 3. The destruction of the membrane of the tympanum by the progressive ulceration. 4. The communication of the inflammation and suppuration to the cavity of the tympanum.

When suppuration takes place we must keep a free outlet to the matter, by preventing the swelling of the tube from closing the passage, and by opening the abscess if formed by the side of the tube: we must prevent the lodgment of the matter by every possible attention. Our injection should be some mild tepid fluid at first, and afterwards we may endeavour to correct the diseased surfaces by the use of a solution of the muriate of mercury in lime water.

If the hearing be dull to all outward sounds, but increased to all vibrations of the head or jaws, and there is a confused and loud noise often heard, there is probably only an adherence of tough mucus, about the opening of the Eustachian tube into the throat, or perhaps an inspissation of the ear-wax, which both prevents the sound from entering the tube freely, and by pressing on the membrane of the tympanum prevents the free motion of the membrane. In this deafness from the inspissated

wax, we have only to wash out the tube with a syringe and tepid water, using the probe.

When the Eustachian tube has been obstructed by a disease in the throat, deafness is the consequence. It is in this case that it is proposed to puncture the membrane of the tympanum, that like the hole in the side of a drum, it may give freedom to the contained air, and free play to the membrane of the drum; the perforation becomes a substitute for the Eustachian tube.

But I deem it to be of more consequence to speak here of the dangers of deep suppurations in the cavities of the ear.

Suppuration may take place in the cavities of the ears, and in the mastoid cells, either from the communication of inflammation from the outward tube, from the throat, by the Eustachian tube, or it may be a scrophulous disease, originating in the bone itself. Any one who thinks of the principle of Pathology, which guides us in our surgery of the head, must at once foresee danger from suppuration and caries of the temporal bone, for though it contain the organ of hearing, yet it takes more importance, in this instance, as a bone of the cranium.

The worst character of the disease is when, after the patient has had violent pains, he is attacked with shivering and fever, and the organ is destroyed, and the passages of the ear are full of pus, and the bones of the tympanum have come away. This discharge may continue long, without any further apparent bad consequences than

the

the loss of the organ, but if there comes drowsiness, and oppression, and a feebleness or degree of paralysis in the opposite side of the body, then the petrous portion of the bone is carious, the dura mater attached to it has partaken of the disease, and the side of the cerebellum and base of the cerebrum are diseased and covered with purulent matter.

The abscess sometimes forms in the mastoid cells, and making a slow progress, such as characterises the scrophulous action, after a time the tumefaction of the integuments over the mastoid angle of the bone betrays the presence of disease. The bone in some instances becomes carious, and the finger can depress the integuments into the bone; and, when this is opened, it is not merely a disease of the bone which we discover, but the surface of the brain is exposed, and the probe can be introduced deeper than the thickness of the temporal bone; a circumstance which shews the danger of the experiment. Thrice I have seen such suppuration fatal by the communication of disease to the brain, before the spoiled bone gave way outwardly; and I have ascertained the nature of the disease by dissection.

We learn from this view of the subject, how carefully we ought to attend to symptoms when there is disease in the ear, lest it should become irrecoverably bad, and end in communicating the disease to the brain. We must bleed, and purge, and foment, to allay the pain and inflammation, if it be active. Blisters are to be applied

behind

behind the ear, if a slow continued action is proceeding within; and where we can ascertain that there is caries in the posterior angle of the bone, with danger of the confinement urging the progress of the diseased action to the brain, we have to apply the trephine and penetrate into the cells of the bone; even when this is done, if the petrous portion of the bone be carious, there remains only a hope, that by great care, soothing the action and guarding against the matter collecting, we may gain time, so that the diseased bone may separate, and an abscess in the brain be prevented from forming.

ABSCESS IN THE FRONTAL AND MAXILLARY SINUS.

THE sinuses both of the frontal bone and the superior maxillary bone, are subject to disease. The membrane of these passages, always acutely sensible, and subject to inflammation, becomes either from such general inflammation as we see in catarrh, or from injuries, or the neighbourhood of disease, as from caries of the teeth, the seat of a more confirmed disorder, and of suppuration.

In the frontal sinuses inflammation is attended with dull heavy gravitating pain in the forehead. The pain is more severe on stooping; the integuments over the sinuses are swelled and puffy. The patient is sensible of a peculiar offensive smell, and it will probably be found that, at intervals, there has been discharge of matter from the nose. All this

this may be, and still we must use general remedies, nor think of performing so formidable an operation, as applying the trepan, on the frontal sinuses. It is much more likely to be a common catarrhal affection, than a formidable disease, or it may prove merely head-ach, assisted by the imagination of the patient. But when there has been injury previously, when there are symptoms of a beginning affection of the brain, when there is occasional sickness, or much languor or oppression, or any thing like epilepsy, or paralysis, a slighter indication will satisfy the surgeon of the propriety of an operation. If there be a collection of matter, and an inflamed sinus slowly affecting the brain, the delay of an operation may leave us full of regret.

If the frontal sinus is to be opened, we must proceed with all the precautions, which we should employ in the more common occasion of using the trephine.

1. We have to recollect the thinness of the outer shell of the bone. 2. The obliquity of the inner table. 3. The partition which divides the two cells. 4. We have to remember that the lining membrane of the cells will probably be thickened, and that if diseased, it looks like a suppurating brain, and has actually been mistaken for such! 5. That, when the trephine has taken out the circle of the outer table very neatly, the membrane will still be entire, and require to be opened with the lancet. The cure will then be conducted by emollient injections. No tents or dressings ought

ought to be introduced into the cavity; a fear was formerly entertained, that a perforation of this sinus would leave a permanent fistula: but this notion must have arisen from the effect of improper dressing.

PERFORATING THE MAXILLARY SINUS.

THE abscess of the maxillary sinus is marked by a colourless swelling of the cheek, over the bone, by a pulsating pain, deep seated in the cheek, generally fixed to the cheek, though sometimes extending over the whole side of the head, but not increased on pressure, by an oozing of matter by the side of one of the molares, sometimes by a discharge of matter from the nose. We find indeed that the most frequent complaint of our patients is that of foul matter flowing into their mouth, when they lie in bed. In the later stage of the disease, the distortion of the face is most remarkable, and sometimes suppuration takes place external to the bone.

We are to be careful to distinguish this disease from rheumatism, tooth-ach, and the nervous affection of the face. When it arises from tooth-ach, succeeded by high inflammation, or comes after fever, or succeeds to injury of the bones of the face, or has any such ostensible cause, it is favourable; and by the drawing of one of the molares, or perforating the sinus, and thus allowing a free exit to the matter, the disease will be cured. The tic douloureux is a disease very different in its symptoms and course. It is not attended with swelling

nor

nor pulsating pain, and the interval of relief is perfect betwixt the paroxisms.

The treatment necessary in this disease, is to draw the second molaris, and then to pass up a stilette of the size of a writing quill, into the sinus. But before deciding upon the tooth to be pulled, we must examine the whole range to see that none are loose, or indicate their connection with the disease by the pain they give when struck. Nature seems to point out that this is the better place for perforating, by the matter seeking this outlet even by the side of the teeth. However, the operation is sometimes done by perforating above the alveolar process. The objection to this last place is that without taking away a piece of the gum, it is difficult to keep the perforation open.

If the perforation be made in the side of the sinus, a very small trephine may be made use of.

When a patient presents with the sinus opened, and the matter running from it, the operation having been done some time before, we are not to despond, but to enlarge the opening, for it has probably been made too small or has contracted. A gold tube is sometimes introduced into the perforation to keep it sufficiently open, and to secure a free discharge.

When the swelling has subsided, and the discharge remains fœtid, the patient can force fluid from the mouth into the cell by the tongue merely. Advantage is taken of this to throw up brandy and water or lime water.

If in this disease there should form an ulcer on the cheek, or just under the orbit, the disease is still to be relieved by the operation performed below, since that opens into the floor of the antrum, while the attempts to preserve the opening on the cheek, and to throw in injections there, will increase the deformity, even if they should be in the end successful in curing the disease.

The bone itself is sometimes carious: then from the offensiveness of the discharge, tincture of myrrh with a little camphorated spirits, or lime water and calomel, or a solution of sulphate of zinc, will be found useful as an injection. The dead bone must sometimes be taken away, and then an incision into the cheek will be necessary, and perhaps the application of the trephine.

SECTION XIII.

OPERATION PERFORMED FOR THE RELIEF OF LAMENESS FROM CONTRACTIONS OR RUPTURES OF THE MUSCLES, AND TENDONS; WHETHER OWING TO DISEASE OF THE MUSCLES, TO ORIGINAL DEFECTS, TO INFLAMMATION AND ADHESION, OR FINALLY TO ACCIDENTS.

THIS section embraces a very extensive department of practice, where much may be accomplished for the relief of the patients, where there is indeed much to do, and much perseverance required. The cases which are brought to the surgeon assume a very great variety of characters, and require ingenuity in the adaptation of the mechanism to produce motion in the limb, and tc correct the shape. I shall do little more in this place than state the nature of the deformities, and the principles, which are to direct the surgeon. The application of these, principles would lead to the description of an endless variety of bandages and instruments.

The first cause of stiffness and distortion which I shall mention, is that which come as a consequence of disease operating a change on the muscles. The

 second

second shall be the contraction and stiffness from inflammation of the tendons and ligaments; and in the third place, I shall enumerate some of the congenital defects in the limbs of children.

WRY-NECK.

THE distortion taking this name is occasioned by a disease of the sterno-clido-mastoideus muscle.

In the case of wry-neck, which is submitted for operation, the mastoid process, is as it were drawn towards the sternum, the head is inclined to that side, and the chin is pitched up. On examining the cause of this, the mastoid muscle of that side, will be found to be smaller than that of the other side; it feels stringy and hard; it will not stretch when the muscle of the other side acts, so that it suddenly checks the turning of the face towards the same side.

The disease of the muscle which occasions this distortion is a very singular one. The muscle is changed into a firm substance, which to the knife cuts like gristle, and which is equally incapable of contraction or stretching. I have chiefly seen the portion of the muscle which arises from the sternum, diseased in this manner; it would appear that to others the clavicular portion, has oftener presented thus changed in its texture.

In one instance I traced this disease, to a fall, and twist of the neck. We cannot imagine a more likely cause of this disease, than a strain upon the muscle. I have seen a similar disease, in a portion of

of the biceps cubiti, occasioning a check on the motion of the elbow joint.

The only thing that the surgeon has to consider deeply is, whether the twist of the head proceeds from this disease or not. Whether the scaleni or some other muscle than the sterno clido mastoideus be affected. Whether the vertebræ have not greatly suffered. He has to see that there be no paralysis of the muscles of the opposite side, rather than a permanent induration of those he intends to divide. If the distortion proceeds from a contraction of the skin of the neck, it will be sufficiently apparent.

OPERATION.

THE patient may be supported upright on a chair, then examining well the tract of the stringy part of the muscle, an incision is made two inches and a half, or three inches in length, through the integuments over this diseased part of the muscle. This will be found to carry the lower part of the cut, within an inch of the sternum.

Having cut down fairly to the surface of the muscle, the muscle is to be relaxed by moving the face to the contrary side, and then the finger, or the handle of a knife or hook, is to be insinuated behind the contracted and diseased part of the muscle. This part is to be cut across by successive lesser cuts, the handle of the knife, or hook which is under it, guarding the parts below ; or a directory is introduced, by which the knife is guided under the muscle, when the diseased part

of the muscle is to be divided by drawing the knife outward; the part, as I have said, cuts firm like a tendon or cartilage. When the whole diseased part is cut across, the patient feels as if a cord which had long bound down the side of his head was cut across; he can turn the head towards the other side, but he brings it round again with more difficulty, and for a time the position of the head is awkward. Some will cut through the tendonous origin of the muscle, rather than the belly of it. The operation is nevertheless to be done as I have just described.

We soon see the advantage of the first incision, being in the length of the neck, for the more we make the patient hold the head towards the other side, the closer the lips of the wound are drawn, though the space betwixt the cut surfaces of the muscle be considerable. I have not found the bandage to be necessary, during the cure of young people, the antagonist muscle answering the purpose; but if, after a long continuance of the disease, there should be such a change in the form of the vertebræ, that it requires the continued operation of a bandage, then a roller is to be put around the head, and brought over the opposite ear, so as to come down forward and pass under the arm-pit.

Sometimes, I must allow, during the cure, there is a disposition of the head to fall again to the same side, and the use of a bandage or collar may be necessary to preserve it in equilibrium, until the parts are healed.

If

If the distortion be owing not to the rigidity of a particular muscle, but to a more general defect of the muscles of the side of the neck, or to general thickness, and induration of the integuments, we must be contented with other means.

The cure of such rigidity in the muscles is to be attempted by giving motion and exercise to them. The head is to be long and gently moved, assisted by the hands of a friend, and a spring or bandage is made to operate continually to the support of the head, and the rigid parts of the neck are to be occasionally bled with leeches, or cupped, fomented, and rubbed with liniments.

OF RIGIDITY AND CONTRACTION OF THE LIMBS.

When a joint is anchylosed, the ligaments, tendons, and even the muscles, loose their natural texture and strength. Want of use, it appears, is attended not merely with the diminution of the substance of the muscle, but an actual change of structure takes place, and the tendons and ligaments about the anchylosed joint become also weak and imperfect, they lose their natural character, they are no longer white, fibrous and strong, but degenerate towards the nature of common cellular substance.

From whatever cause the play and motion of a joint may have been lost, it appears from these facts, that we must be very cautious in our first attempts to restore its movements. If it can be made to move in the slightest degree it is not anchylosed,

it is only stiff, and the stiffness has arisen either in consequence of inflammation changing the natural secretions of the sheaths of the tendons, or of adhesion of these tendons to their sheaths. If such be the state of the joint, and if all diseased action has ceased, then it is possible to restore the use of the limb by moving it at first gently, then more freely, and after a time with more boldness, and for a longer continuance. By this motion of the parts the ligaments are regaining their strength, the muscles also are resuming their structure and function, and the natural lubricating fluids are every where poured out, and the cellular substance, which was condensed, becomes more loose in its texture and more cellular, so as to admit the motion of the bones and tendons.

To have a lively conception how a stiff joint may resume its uses, we have only to recollect how, out of the common cellular substance, an artificial joint will be produced having ligaments, bursæ smovia, and all the apparatus necessary to admit motion. In this artificial joint (as when a bone is broken and does not unite) it is the motion which produces this extraordinary change upon parts not naturally calculated for such uses; and how much more certainly will it produce a renovation of character in the parts around a stiff joint, which have only suffered from inactivity.

There is no stiffness of joints which will not yield to motion, if the original cause of the inflammation has ceased, and the hands of the assistant will be sufficient to bestow the necessary motion.

 But

But how seldom can we depend upon the industrious and persevering operations of an assistant. It is this consideration which makes it a duty to invent machines to move the contracted or stiff limb; and the simple description of such instruments is to say, that they are to consist of a lever or pendulum, which with less exertion and trouble are to give a full motion or operation to the joint; for the same purpose sometimes springs are employed.

Inunction and friction are at the same time employed to give suppleness to the joint; but it is not in this way that friction and external applications operate. They are of much consequence to the cure; but it is by tending to relieve any remaining inflammatory state of the joint, or to prevent its return. It is, for the same reason, that bleeding with leeches is necessary during these operations, to restore the motion of joints.

There is a contraction, which comes as a consequence of disease in the tendons, which is more difficult to cure; nay, even to counteract, although we see it in its commencement; for example, a knottiness and stringiness will be observable in the tendons in the palm of the hands; the fingers will have a certain stiffness; there will be an unmanageableness of the muscles of these fingers, so that in writing, the pen will be squeezed flat; a contraction of the fingers will follow, until they be bent into the palm of the hand.

There is a distortion of the feet, attended with relaxation of the ligaments, that is very trouble-

some

some to cure. A child from some defect of the muscles, will set its foot unequally to the ground; the ligament of one side of the ankle-joint will be kept upon the stretch, until yielding, the child will at last stand on one side of the foot. Here a mechanism is required, which will give the substitution of a spring, instead of the restraint of the ligament, so that while the foot is permitted to have its natural motion, it shall be prevented falling to one side; and the cure is completed by removing that unequal pressure which stretched the ligament; the ligament contracts, and is restored to its proper use.

Much may be done to remove the distortions, which appear at birth. When we dissect the distorted foot, in the individual bones there appears very little wrong; a certain obliquity is common to all the bones. And it is made evident, that a very little restraint in the growth of the foot during infancy would have corrected the malformation. Experience leads to the same conclusion. It is quite possible to mould the foot during its growth to correct its shape, and to place the sole directly to the ground.

The distortion of children's feet arises sometimes from the unequal contraction of the muscles. We see the gastrocnemii and the solei so strong as to keep the feet of an infant permanently extended in a line with the legs; so that in the attempt to stand, the toes or the outside of the foot touch the ground. This distortion must be removed by restoring the equilibrium of the muscles, a spring

 must

must operate to restore the foot to its natural relation with the leg, and then the weight of the body bearing in due direction upon the foot will preserve its form and action. I have recommended in this case an apparatus, which operated by a lever, extended backwards from the sole of the shoe, and which, having a weight attached, pressed up the fore-part of the foot while the child was carried in the nurse's arms.

OF THE RUPTURE OF MUSCLES AND TENDONS.

THE arrangement of my subject, now leads me to say a few words on the rupture of muscles and their tendons.

Muscles in their state of action, acquire strength of cohesion proportioned to their activity; we have therefore some difficulty in accounting for the rupture of a muscle. I conceive it to be a consequence of a partial inactivity of the fibres; for when inactive, they are weak as in death. It is in this way I would account for the partial rupture of the muscular substance of the gastrocnemius. A man makes a false step, and in the sudden exertion to recover himself he sprains his leg as he thinks; he has pain and numbness of the calf of the leg, followed with discoloration of the skin, as if he had received a bruise on it; on examining, a space or vacuity is felt on the side of the belly of the muscle.

If this case be so far misunderstood, that friction and action of the limb are recommended, a further laceration

laceration and continued lameness will be the consequence. The limb must have rest, and the muscle must be kept in a state of relaxation.

There is a circumstance in regard to tendons, also, not commonly noticed. I mean, that by inactivity they lose their power of resisting. If it did not hold, that by exercise the tendons acquired power of resistance, as the muscles encrease in power of contraction, those athletics and tumblers, whom we see doing wonderful feats of strength, would tear their tendons and ligaments at every motion. As the tendons encrease in strength with activity, so they lose it by long rest; and if a man shall live an indolent and luxurious life, the muscular strength may happen to be preserved in a degree too great for that of the tendon; so that when he rises to any great exertion the tendon breaks. Thus, in three several instances, I have seen the fathers of families on some annual festivity rise to dance with their children, and break the *tendo achillis*.

On one of these occasions, the gentleman turned in rather too animated a tone to accuse his neighbour that he had struck him on the back of the leg! And they have all expressed their feeling upon the accident occurring, to be that of a smart blow received on the part.

The manner of treating the rupture of this tendon, is to procure the relaxation of the muscle, and to make the points of the origin and insection approach. The foot is to be extended, and the knee a little bent.

First,

First, extending and pushing out the heel, let the belly of the gastrocnemius be brought down. The meaning of extending the heel is, that when the leg and foot is in a position to relax the muscle, the muscle partakes of a disposition to relax; and, therefore, in this posture it will be found more easy to bring down the belly of the muscle, and to preserve it so by a roller put round the upper part of the leg. The roller is not to be brought so low as the place of the rupture. A sock or shoe is put upon the foot, and from the sole of it a strap is to go up along the back of the leg, and to be sewed or buckled to the roller which is around the calf of the leg, and may be continued over the knee so as to restrain the extension of the leg. This apparatus will extend the foot, and keep the knee bent; but in this position of the leg, the patient must himself persevere; the bandaging will be chiefly useful in restraining the motions of the foot and leg while he is asleep. When the patient attempts to use his leg, he must wear a high-heeled shoe, which will still prevent the flexion of the foot; and he must recollect, that a false step, which calls for an exertion of the leg, will draw the tendon separate, although the foot be preserved in this position. Dr. Monro, when he broke his tendo achillis, did not think proper to use it freely and without assistance for five months.

SECTION XIV.

SOME OBSERVATIONS ON THE SURGICAL TREATMENT OF THE JOINTS.

OF THE KNEE JOINT.

OPERATIONS are at least proposed to be performed on the knee joint, which make it necessary to take a general review of the diseases of the knee. Why we should take this joint in particular before the hip joint is sufficiently evident. It is the largest joint; it carries the whole weight of the body and limbs; it is weak in the structure of the bones, and consequently complicated in its ligaments. The ligaments and tendons about joints are very subject to disease, and here they are exposed, being only covered by the integuments, whilst in the other larger joints they are protected by large muscles.

IN WHITE SWELLING, an uneasiness and weakness in the joint are first observed; the pain increasing, it becomes fixed; and now on each side of the tendon of the patella there is a soft, puffy tumefaction. *White Swelling* is a term in common use, but it includes various diseases of

of the joints, when there is deep inflammation of a bone or joint. The integuments are swollen over the part inflamed, without at first partaking of the inflammation; and the white, firm, and smooth integuments present, therefore, a contrast with other inflammatory tumours.

The swelling of the knee in this disease has something peculiar in it; the skin is smooth and clear, the tumour regular and uniform, covering and concealing the natural projections of the heads of the bones, and the transparency of the skin exhibits the ramifications of the veins.

The disease is yet in the ligaments and cellular membrane around the joint, and perhaps not yet in the cartilages of the joint. But now a very peculiar appearance is produced. To save the pressure on the joint the patient allows the toes only to touch the ground, the knee is consequently bent, and the inflammation which surrounds the hamstrings produces a permanent stiffness, the leg and thigh waste from inaction, so that altogether the swelling of the knee appears more remarkable than it is in fact.

The disease proceeding in its course, and the hectic fever being established, the strength and spirits fail; the cartilages of the joint are now consuming, and about this time the symptoms are aggravated by external inflammation; the skin sometimes bursts and discharges pus, which has often no connection with the general cavity of the joint, nor does this discharge diminish the swelling, or relieve the pain of the joint in any considerable

derable degree. But matter is now formed around the joint, and the sinuses will sometimes admit the probe to pass in all directions. The fluid discharged teaches us the nature of the inflammation; it is thin, and like whey, with flaky substances in it, resembling the white of an egg. This is a discharge characteristic of scrophula.

The patient's sufferings are, for the most part, not continual. He has intervals of some days in which he is free from the violence of the disturbance. But the attack sooner or later is made by pain in the joint, followed by fever, and accompanied with increased redness in the inflamed skin, and irritation upon the sores. It again subsides, but never leaves the system free from irritation; and often the strength is exhausted by these repeated paroxysms and by continued irritation, and the patient will die of hectic if the limb be not removed.

When the leg is amputated, this is the appearance which is presented on dissection. The cellular membrane around the joint is loaded with viscid fluid, which, contained in the cellular texture, resembles jelly. The ligaments have lost their natural density and lustre, and fistulous sinuses run betwixt them and the surrounding tendons; within the joint there is lymphatic exudation, in the advanced state of the disease the cartilages are corroded, and lastly, the bone itself suffers by ulceration.

The disease varies much in its period. I have seen it run its course in two months, and I have seen

seen the constitution bearing up against it for years, though the disease was most distinctly marked, and the suffering almost continual.

To say merely this is a scrophulous disease, is saying very little. It is a disease falling peculiarly on parts having little blood circulating in them, and which consequently possess low powers of life. It seems first to attack the ligaments, and we have proof of this in the frequent origin of the complaint from a twist or sprain. Sometimes the disease is at first an affection of the general membrane of the joint, or, as Mr. Brodie properly calls it, the synovial membrane; and this latter origin of the disease I believe to be the worst one, implying a stronger constitutional tendency. I see many varieties in the appearance, symptoms, and course of this class of diseases.

Often I have known surgeons in consultation on the propriety of amputating in a white swelling of the joint, give their opinion decidedly for amputation, because the bones were enlarged. But, on dissection, there proved to be no enlargement. Mr. Russel well remarks in his treatise on this subject, that the bones are seldom diseased when they appear to be so, and that the deception proceeds from the effusion that is around the joint. But the bones are actually enlarged sometimes, and yet this is no cause for cutting off the limb. There is no reason for determining on an amputation but the declining of the patient's strength to a dangerous degree. I have looked on the enlargement of the bone with satisfaction, as providing for anchylosis of the joint.

If it be denied altogether that the bones are enlarged, then how does it happen that a patient comes to us saying, "It is very odd that my bad leg is longer than the other, although I keep it thus bent;" is there any other way of accounting for this than by supposing that the bones are enlarged? The enlargement of the bones favour the cure of the disease in this manner: they do not ulcerate on the surface but become inflamed and spongy in their whole substance; the articulating surface becomes irregular, and ill adapted for motion; the motion of the joint is lost, the bones unite; and there being no longer irritation from the incessant motion of the joint, the disease fortunately subsides.

When a patient, perhaps of a weakly constitution and pale countenance, is seized with an attack of pain in the knee, I do not immediately think of applying leeches; but, on the contrary, foment, wrap the limb in flannel, and keep it in perfect rest.

If the pain continues, and is fixed, not diffused over the joint, nor has shifted to any other joint, there is danger of a confirmed white swelling. Blood should now be drawn from the part by leeches; and this is done not so much with the intention of reducing the inflammation as to prevent a great increase of action on the application of blisters to the sides of the knee joint. Repeated blisters are necessary to remove a deep-seated disease. When there has been a tendency to inflammation, and considerable action in the knee, blisters have increased

creased the general action in the joint, but when the activity of the vessels are previously diminished by leeches, they seem to substitute the superficial inflammation for the deeper disease. A blister should be applied on one side of the joint, the size of the palm, and as the inflammation subsides, a similar one is to be put on the other side, and thus a considerable action is to be kept up on the surrounding surface. But let it be understood, that in consequence of motion of the joint, when in this inflamed state, there will sometimes rise a much greater disturbance, and the repeated application of ten or a dozen leeches will then be necessary.

Unless there is strong reason to suppose that there is an active inflammation in the joint, I would not recommend the common cold application of linen wet with the solution of cerussa acetata in vinegar and water. If the swelling and general inflammation of a joint have succeeded to a blow, then I would bleed freely with leeches, and apply the cold wet cloths to it; but if, in a constitution not prone to active inflammation, there comes a pain not fixed nor severe in degree, I recommend occasional warm stimulating fomentations with flannel or sinapisms to be applied to the joint, and the application of stimulating plaster, as of gum ammoniac, with vinegar of squills, or the cummin seed plaster. To weakly children with diseased joints, there can be no better applications than the latter.

When called to consultation, on the question of amputation for white swelling, we find, that various things

things have been applied; some have put their trust in cold bread poultice; some in a mixture of sugar of lead, camphor and spirits; some in the warm plaster or the stimulating embrocation, or they have kept up a crop of pustules on the surface by the solution of corrosive sublimate, or blisters, or setons have been used. But what does this resolve into? The attempt to substitute an artificial inflammation on the surface, to substract from and reduce the internal disease; and for this purpose these remedies are all inefficient compared with the continued use of issues made by the caustic.

An inflammation of the joints (the knee joint for example) which has no mark of the scrophulous action, nor any thing constitutional in its nature, must be treated with a more rigorous intention of diminishing action. Leeches, and after them cold saturine solutions, are applied to the joint; and if the pulse and general fever be rising, blood must be taken freely from the arm; the patient must be purged with the neutral salts; and after the bleeding and purging, an opiate at night will have the most soothing effect.

When high inflammation attacks the knee in consequence of a blow, and is subdued by evacuations and cold applications, yet it will happen that the relief is only temporary, and the inflammation in all its violence will return. We are kept long in suspense by the great tumefaction, and the deep pain, and are unable to say whether the cavity of the joint have at length partaken of the disease. When the violence of the inflammation cannot be subdued, and the relief is partial, then suppura-

tions

tions form around the joint, which when very distinct may be opened; but I must here give this caution, that we may not be deceived, and take effusions into the bursæ, or into the cellular membrane, for abscesses.

The inflammation will sometimes be continued and violent, and yet the joint escape, owing to the capsule checking the progress of the inflammation from the outward parts into the cavity.

When the inflammation has been violent, adhesions will form betwixt the tendons and their sheaths, and there will be obliteration of the bursæ. The consequence is a stiff joint. Where the constitution is uncommonly good, we may venture by friction and motion to restore the joint; but where the case has proved obstinate, and the inflammation has continued long, in a more obscure degree, we ought to try no such experiments as extending and moving the leg. Where the limb is longer than the other, after disease of the knee has run its course, I think it wrong to make attempts to give it motion, for this circumstance shews us that the bones of the joint are enlarged.

If the capsule of the joint should be wounded, pierced with a nail, or opened but in the smallest degree, there is great danger to the joint, and even to life. I have seen a man suffering from such an accident, delirious, with his face flushed, the eye brilliant, the limbs swelling in powerful struggles, yet this high inflammation was long in coming, the corner of his adze had been struck into the joint, the wound appeared trifling, and there was not the slightest pain or discolouration for many days. I

have not seen such inflammation of the knee fatal, but I can well believe that it may be. Bleeding and cold applications, but above all absolute rest, will subdue this inflammation.

It is possible to mistake Dropsy of the Knee Joint for White Swelling, yet I should imagine it was easy to discover when there is fluid collected in the joint in any considerable quantity. In the relaxation and dropsy of the knee joint there is no pain, when we press the patella; the swelling is chiefly on the sides of the ligaments of the patella, it is soft and undulating; and putting the hand on one side of the patella, and tapping the other with the fingers, we are sensible of the fluctuation. Often the fluid distending the great bursa will have lifted up the tendon, and even part of the bellies of the quadriceps muscle. This is a disease of weakness. The dropsy that occurs after fever is evidently so, and is removed with the returning strength. Often the swelling comes suddenly, without its being possible to assign a cause; I have seen it ushered in with great pain in the thigh. It has been considered as a consequence of syphilis, of scrophula, of rheumatism, of the use of mercury.

The first thing we have to think of, the most effectual, and that too which can do the least harm, is to apply an elastic flannel roller. I have seen swellings of the knee which were taken for the most confirmed disease disappear in a night. Stimulating frictions and the warm sea bath are to be employed at the same time. Moderate exercise is not only allowable, but necessary to the recovery of the joint, and to give vigour to the circulation.

From

From the violent inflammation which I have described, as a consequence of wounding the joint, it will be evident that my opinion must be entirely against opening the knee joint when such collections are formed in it. This can serve no purpose; we can evacuate the fluid by pressure; at least we can cause its absorption. The difficulty we have is in changing the disposition of the secreting surface, which an operation does not accomplish.

The BURSÆ which are around the joints are sometimes distended with fluid, while the joint is not affected. The bursa under the ligament of the patella, or the large bursa under the union of the quadriceps femoris to the patella, are sometimes full of fluid; these I would be averse from opening, because the opening will do no good unless there arise inflammation, and inflammation under the ligaments of the patella would quickly pervade the whole knee joint.

Ganglions which have long remained small and without pain will enlarge, inflame, and suppurate. If they cannot be subdued by the use of blisters, and if they open, they may be treated with the seton.

No tumours arising from the deep parts of the hip joint should be opened; even the lesser tumours about the ankle joint and wrist ought not to be touched with the knife or lancet.

The LOOSE CARTILAGES or *moveable bodies* which form within the knee joint are not easily accounted for. They are, however, a cause of great distress and lameness. The symptoms are peculiar. A fine young man shall be at cricket, in full career, when

when these bodies escaping from the corners in which they usually lie, and coming betwixt the heads of the bones, he will be thrown down with a pain in the knee, extremely violent, and at the same time sickening and subduing. — It has been a question with me, whether this case has not been mistaken for a dislocation of the cartilages. — Assisted by the experience of the patient, we are to endeavour to get the body from betwixt the prominent parts of the bones; if the body remains long in a situation giving pain, the secretion of the joint is increased, and a considerable inflammation will rise. In this state we must allow the loose body to rest where it is, and keep the patient from exercise until it shall, by some accident of position, drop into the place of rest.

When we have got the body extricated from betwixt the bones, we must endeavour to keep it there by binding the joint, and pressing down the patella, that no exudation may be poured out in any quantity, and that the surfaces of the bones may be kept in contact, so that the body cannot insinuate itself betwixt them.

I have said that I am averse to opening the knee joint, and I have never seen a case of loose bodies in the joints, where I could recommend it, or where the pain, lameness, and confinement, attending the presence of the body, were not outweighed by the danger which the operation presented.

If ever the temptation to operate should present itself to me, it must be in this form: the patient shall have been long tormented, the occasional lameness

lameness and confinement must interfere with his means of living; he must himself prefer the risk to the incessant pain and helplessness; and the body within the knee must be loose, and distinctly felt prominent.

THE OPERATION may be thus conducted: The body having presented in the side of the joint, and being upon trial found to be so far stationary that it bears pressure, and the motion of the skin over it, the assistant is to be employed thus:

He must, with the fingers of one hand, draw aside the integuments which naturally lie over the body to be cut out, and hold them firmly; with the finger of the other hand he must thrust upon the integuments by the side of the body, and into the interstice of the margins of the bones, so that he may prevent the body from moving on that side *. The surgeon (having his instrument ready to be handed to him) fixes the finger of his left hand on the other side of the body to be cut upon; then with a very sharp scalpel he cuts lightly on the skin until the body starts out or is exposed. As soon as it is exposed the hook is to be introduced behind it, that it may be brought forward. If forceps of a common form be used the body is apt to start from them: they should be armed with sharp crooked claws at the point.

* Some have recommended that the loose body should be moved upwards on the side of the condyle, towards the connexion of the capsule with the thigh bone. If this can be done it is certainly better than cutting in the middle of the capsule. But the general rule is to take that position in which the body stands most prominent and secure.

If

If the loose body escape, the probability is that we shall not be able to bring it to the same spot again, and the danger of the operation will have been incurred without advantage. If the body adhere to the ligaments by a neck, it can be cut away easily, but if it have a broad connexion, and require the first incision to be enlarged, and a dissection made, it is very unfortunate.

By all means let the wound be closed as quickly as possible. I cannot refrain from expressing my wonder that any one should recommend the incision to be left open for the discharge of the fluid of the joint. The patient must be kept long perfectly quiet, and the wound must be entirely healed before he be allowed to use his leg.

OF THE DISEASE OF THE HIP JOINT.

This is a scrophulous disease.—It is most common in youth, from childhood to the twenty-fifth year; but the same disease attacks those of more mature years. The disease begins with a deep-seated pain behind the trochanter major. The pain being aggravated by motion, the patient, in walking, throws the weight of the body on the opposite side, and there is consequently an awkward crippling gait. There are many things to mislead both the patient and the surgeon. In the beginning the lameness is often in the limb generally, and even when the inflammation of the hip joint has risen to the highest degree, and the pain is exquisite, the patient mistakes the seat of his complaint! We move him and his pain is in his thigh and knee; we examine the foot and the

pain is in the knee; we touch the knee and there is great pain in it. It is only after a minute enquiry that we find that all this pain is in the hip joint, that in examining the foot or knee it is the motion of the thigh bone in the socket which gives pain, and that the sensation actually in the hip is referred to the knee.

When the disease is formed, and while yet in its first stage, the limb is lengthened. This is not merely a feeling of greater length in the limb occasioned by the inflammation and increased sensibility of the parts which form the hip joint, but there is a protrusion of the head of the thigh bone from its socket.

During this progress of the disease, there is as yet no discolouration of the skin; but the hip is swelled over the joint, and, from want of use, the muscles of the hip are flabby. The trochanter major is prominent, and in consequence the hip is increased in breadth, and there is to be felt an enlargement and projection of the tuberosity of the ischium as well as prominence of the thigh bone.

With the want of exercise the leg and thigh waste, and, in the advanced state of the disease, the limb instead of being longer is considerably shorter. The difficulty in the motion of abduction or throwing the leg out sideways is greater than that which is felt in moving the limb in any other direction. This is owing to the new relation of the bones, or the entire dislocation of the femur. That peculiarity in the seat of the pain, which I have mentioned, must be held in remembrance, else we shall be employed in fomenting the knee and leg

leg for a disease in the hip. I have found a disease of the nerve in the ham, producing pain in the sole of the foot, continued for nearly two years. So I believe that in this case the ischiadic nerve passing so near the seat of disease is affected, and pain is the consequence, which is attributed to the outside of the thigh, the knee, and leg. When the pain is deep in the groin and in the inside of the thigh and knee, it is probable that the obturator nerve may be involved in the inflammation.

When suppuration takes place, there are startings and catchings during sleep. The pain is increased, with much tension and throbbing; now the skin inflames, and the abscess bursts either in the groin or behind the trochanter. Successive abscesses will sometimes form around the joint, and still the patient survives. It sometimes terminates by anchylosis. The limb being fixed, the granulations of the inflamed joint run together, they ossify, and the disease subsides.

But often the abscess advancing and the skin being inflamed, hectic fever rapidly reduces the patient; there is perspiration, diarrhœa, a white tongue, a face changing from the hectic flush to the leaden coloured paleness of those who are tabid: they linger thus and die.

This hip disease is an inflammation peculiar to the scrophulous constitution. It attacks the ligaments and cartilage in the parts enjoying a less active and vigorous circulation. There is danger of its being confounded with rheumatism, gout, or even the psoas abscess.

In my Collection the reader may see the consequence of this disease of the hip joint. 1. The cartilages absorbed and the bones wasted. 2. The head of the femur dislocated, and drawn up to the back of the os ilii, in consequence of the destruction of the ligaments. 3. The head of the femur quite destroyed by absorption. 4. The bottom of the acetabulum corroded, and a passage this way made into the pelvis. 5. The bone firmly united by anchylosis.

When young persons complain of pain and stiffness in the hip joint, I make them use stimulating liniments, and the hip bath of warm water and salt, covering the hip with a warm stimulating gum plaster. If the disease be really incipient, a succession of blisters should be applied to the hip. Sometimes the disease begins with a very considerable violence of inflammatory symptoms, and then cupping, or bleeding with leeches, is necessary, before the application of blisters.

However, the remedy chiefly to be relied on in the cure of the disease of the hip joint, is the decided and severe use of caustics. Let the eschar be formed behind the great trochanter, and let the issue be kept very active by proper dressing. If matter forms around the hip joint, it should be let out by an oblique puncture of the lancet, and the wound closed. I have found it necessary thus to discharge an abscess in a child's hip five times. It may not be foreign to the purpose to point out the manner of the attack in this instance.

A child

A child at the breast was seized with convulsive croup, which was so severe that many times the child seemed irrecoverably gone. The fits came in very irregular succession, and I attributed these attacks to disorder of the bowels. An experienced physician and accoucheur, strongly insisted on the gums being the occasion of them. The child's gums were severely and repeatedly lanced. The attacks became more frequent, with alarming convulsions. I now had the child stripped and examined, when I discovered the hip to be very greatly swollen. Suppuration had already taken place; but by treating it as I have described, the child recovered, and with the recovery of the hip, the disposition to the croupy spasm and fits left him.

There is another shape in which the disease shews itself, so as to lead away the young surgeon from a right understanding of the complaint. The mother brings her infant, describing him as having lost the firmness and power of motion in the limbs. We are led first to look to the spine, but on laying the child on its belly, the one hip is seen to be larger than the other, and the corresponding leg powerless, and perhaps shrunk.

Even in more advanced years, the patient may be brought to us, not for a disease of the hip, but for a shortness of the leg. When we come to examine the limb, we find it shrunk and diminutive in all its measurements; but on making the patient stoop forward, and measuring the fulness of the hips, that of the diseased side is seen to be much fuller and rounder, and the trochanter more prominent.

SECTION XV.

OF THE DISEASE AND INJURY OF THE SPINE.

OF THE DISEASE OF THE BODIES OF THE VERTEBRÆ.

THE spine is particularly subject to scrophulous inflammation, and, from the circumstance of its being a pillar bearing the weight of the trunk, and at the same time containing the spinal marrow, this inflammation is attended with most distressing symptoms. The spine is subject to distortion in consequence of rickets and mollities ossium, but what we now allude to is quite another form of disease. The bodies of one or more of the vertebræ becoming soft, and yielding to the incumbent weight, the corresponding spines are thrust out posteriorly.

In an infant, these are the symptoms: the mother tells you that the child was strong and healthy, and perhaps that he had begun to use his feet, and could stand upright with little assistance, but that of late he does not try to stand, and when laid over her knee, he does not struggle as children na-

 turally

turally do with their feet. You find the child's flesh soft; and particularly the skin and muscles of the lower extremities soft and woolly; upon examining his back, you find one or two of the spinous processes of the vertebræ particularly prominent.

The tumour is most commonly on the lower vertebræ of the back. When you feel the chain, and touch the bones in succession, the pain which is felt indicates the seat of disease, even before the tumour is perceptible. If the tumour be formed, you may know that the disease is active by the fulness of the integuments over the bones, and the obscurity, with which you feel the prominences. When the diseased action has subsided, and the curvature remains, the surrounding swelling subsides, and the natural protuberances of the bones are felt.

If the child be old enough to have walked, he is gradually deprived of the use of his legs; he complains of languor and fatigue; he is listless and unwilling to move; his legs are apt to cross, and he stumbles often, being unable accurately to direct the feet. He leans forward, and there is a projection in the spine. Large abscesses sometimes form and drop down upon the loins, and appear externally in the top of the thigh, or a tumour is formed by the side of the vertebræ of the loins.

The destruction of the bone having gone thus far, the affected bodies of the vertebræ sink under the incumbent weight of the head, chest, and arms.

 The

The paralysis of the lower extremities is now for the most part distinctly marked; but as I have seen this symptom before the sinking of the vertebræ, I have concluded that the neighbourhood of the diseased bone has involved the spinal marrow in the morbid action, so that its function has suffered. The cessation of the disease relieves the paralysis; which is accounted for by supposing that the spinal marrow and the tube of the vertebræ become adapted to each other; but the circumstance is equally well explained by supposing this to be the result of the cessation of the diseased action, that is, of the inflammation.

In the latter stage of the disease there is pain of the back or loins, which even in bed is tormenting and incessant; the breathing, and indeed the whole functions of the thoracic and abdominal viscera are oppressed by the chest falling down in consequence of the great curvature of the spine. The urine and fæces are passed insensibly, and in consequence of this, perhaps as much as by sitting on the insensible buttocks, (the perpetual pressure on which gives no token of the degree of injury they sustain,) deep sloughing or horrible ulcers take place.

By dissection I have found that the first stage of the disease is not merely attended with an increase of vascularity and softening of the bodies of the vertebræ, so that they sink under the weight of the body; but the progress of the destruction of bone proceeds by the absorption of several intermediate portions of the body of the

 verte-

vertebra, leaving the spine supported by the remaining firm parts, which are sometimes like columns standing betwixt that which is decayed. (I have given a plate of this early appearance of the disease.)

I am inclined to believe that the disease sometimes commences in the intervertebral substance. The preparations in my Collection exhibit every variety in the appearance presented on dissection consequent to disease. We see that sometimes after the partial wasting of one or more vertebræ, that their bodies have become united and anchylosed. We see that in other examples, whole vertebræ have disappeared: in some the suppuration has extended over a great extent of the fore part of the spine; and in one example we find the matter making its way out on the loins. In sections of the diseased spine, we see that notwithstanding the curvature, the tube for the lodgment of the spinal marrow is not diminished.

In a young person who has shot up to great height, and whose muscular strength is not proportionable, there is a possibility that a curve of the spine may arise from a bad habit merely, but these curvatures are generally lateral. In the true disease, the pain or uneasiness deep in the spine, with that countenance and habit peculiar to scrophula, will urge us to examine the spine; and if we should not find that there is a beginning prominence in the spinous processes of one or two of the vertebræ, yet by pressing with the fingers along the spine, some one of the spinous processes will be found to give

pain perhaps, and in this case we should not delay the remedy.

The grand remedy for this disease is the making of issues or setons by the side of the affected part of the spine. But I cannot think that the good effect of these artificial ulcers is from their acting as drains. I see them lose their effect when they become stationary; I see, even in the first violence of the irritation and inflammation, a remarkable change on the disease for the better, which does not continue if the surrounding skin and deeper parts lose their inflammatory action. Once I found quick and remarkable relief given by the caustic eating much deeper and broader than I intended or thought right; and I have on another occasion witnessed the remarkably good effects of the hospital-sore catching the issue, and destroying the soft parts to a great extent. In this last instance the healthy inflammation which succeeded the sloughing of the sore made an immediate change on the disease, and the patient got quite well. In short, I conceive that the inflammation excited in the neighbourhood of the disease, (which is of the nature of a slow and sluggish scrophulous inflammation,) invigorates these affected parts, and, reaching even to the vessels of the bone, changes the nature of their action, and restores the natural influence.

In this view I prefer the making of issues with the caustic, of a longitudinal form, by the side of the curve of the spine, first on one side, and when the consequent inflammation is contracting, and the

ulcer likely to become stationary, I make another in the other side of the spine, for a time neglecting the first; and afterwards I conceive it necessary to keep up a considerable degree of irritation in the one or other of the issues. I believe pain, or in other words, irritation, to be absolutely necessary to the effect, and I cannot prefer the seton to the caustic because it gives less pain.

A most essential part of the cure, is to preserve the inflamed part of the spine against the continual excitement from the weight and motion of the body. Confinement to the horizontal posture is the immediate resource when the disease of the spine is evident; and when the disease has made progress, and there is great irritation from the destruction of the bone, it is quite necessary that the patient should be laid on his back; to which end it will sometimes be necessary to have the mattrass on which he lies hollowed out for the projecting spine.

But it is possible to support the weight of the body so that the diseased vertebræ are saved. For this purpose, there is an apparatus which, resting on the pelvis, supports the head and the whole spine. But I may remark upon this subject, that our object should be to support, not to stretch the spine.

If we find that by an apparatus we can elevate the vertebræ which have sunk, yet this should not be done, for the final cure is to be obtained by the anchylosis of the vertebræ. If they have been

been once destroyed, and have sunk, to separate them is to prevent the natural process of cure.

Here, as in most cases, pain is the indication of mischief, while relief from it gives hopes of an amendment. Now when we see a poor creature moving with much distress, seizing on every object for assistance, and leaning with his hands on his thighs to give relief to the pain of the spine, how can we doubt but that to take off the pressure of the head and chest will promote the cure?

The success of our endeavours to cure this disease in the spine, is to be judged of by the allaying of the complaint of pain, or of fatigue of the loins; by the sleep and appetite being good; by the ceasing of involuntary spasms of the limbs, the flesh of the thighs and legs being firmer to the feeling; lastly, by the diminution of the curvature of the spine, and by the patient perceptibly growing taller.

I am naturally called upon here to say a few words on rest, and its absolute necessity in this, and in many other diseases of the bones and joints. Those who are bedridden are generally suffering from disease, and the weakness induced by the disease is attributed to the confinement: but the contrary holds good, when the disease is of a nature to be relieved by rest; for then lying in bed restores the patient: under the confinement he gets fat instead of wasting. Lying in bed is too often a confinement to bad air, the breath and exhalations are confined, and a free circulation of air is not admitted. But if, on the contrary, the person confined

confined to bed be cheerful and not despondent, and if he be as careful to change his apparel and bed-cloaths, and to wash, as if seeing company, and to eat and drink in the moderation proportioned to the little exhaustion or exercise which his situation allows of, he will enjoy health.

In very bad cases of distorted spine, therefore I conceive that it will be better to keep the patient in bed or on a sopha, until there be a favourable change in the disease, and that when the anchylosis has formed, or the diseased vertebræ are consolidated, the patient may have the relief of setting up, or of moving about under the apparatus for supporting the spine, until the cure is established. If the child be young, it will only be necessary to take care that he be not carried in the usual way in the nurse's arms, but lie horizontally. If the child be more advanced, it will be very difficult to keep him lying on his back, he will rise upon his elbow, and sit half up, which produces more derangement of the vertebræ than if he were permitted every degree of freedom.

I have found a little patient in these circumstances; first the hip was diseased and suppuration took place, but by the proper treatment it got well; then the spine became affected, the active state of the disease was subdued, and the child was confined to the mattrass bed. But he got better in health, and became lively; and the parents said it was impossible to keep him lying. I saw that the curvature of the spine was becoming more confirmed, and the thigh bone in danger of being anchylosed, in

in the most inconvenient posture. It was therefore necessary to contrive some method of giving him exercise without danger to the spine. The common apparatus, bearing on a chair or resting on the pelvis, would not do in this instance. I suspended a rod by the middle to the roof of his nursery: it swung round on a swivel: on the extremities of the rod were pullies, through which a strong cord was run: one end of this cord was attached to the apparatus for suspending the head and shoulders, and to the other a regulated weight was attached. I was careful not merely to adapt the apparatus, so as to support the child's head and spine, but the body and shoulders had distinct connection with the cord, so that their weight was taken off the spine.

My object here was not to raise the spine, therefore I did not apply a weight fully equal to the weight of the trunk, head, and arms of the child, but nearly so, so that the spine was not stretched, but only the incumbent weight taken off the tender bodies of the diseased vertebræ: I was also attentive to make every thing elastic, so that no sudden jirk might be given to the spine. The rod bent with the weights appended; the weights themselves ran easily on the pullies: the cords suspending the head and arms were spiral wires. By this machine the child was able to sit up, to vary his place and posture, to walk round the room, and to vary his exercise, without fatigue to the spine; and by this means, though of the most delicate constitution, both the spine and hip joint rapidly improved.

The

The motion of the legs without the usual weight of the body upon the hip joint, appeared to be attended with unusual benefit; the thigh could be more and more stretched; and at last the entire motion of the hip joint was restored.

OF THE LATERAL CURVATURE OF THE SPINE.

When there is any deficiency of the phosphate of lime, which gives solidity to the bones, the spine suffers in the first place, and to the greatest degree. This ricketty disposition is to be cured by an attentive examination of the peculiarities of constitution, by endeavouring to discover the source of this failure of the constitutional powers, and to employ the proper remedies; the alvine evacuations are to be examined, the deposit from the urine, the state of the skin, and the circumstances of situation to be considered. We may be thus informed, how the due assimilation of the hardening matter of bone is prevented, or if there exist a disease of over absorption. This is a subject so extensive that I cannot enter upon it here, my duty limiting me to some observations on the distortion of the spine. It is, however, necessary to state, that while aid is given to support the spine, it will be of no avail, unless attention be at the same time paid to remove the cause, and to restore the general health.

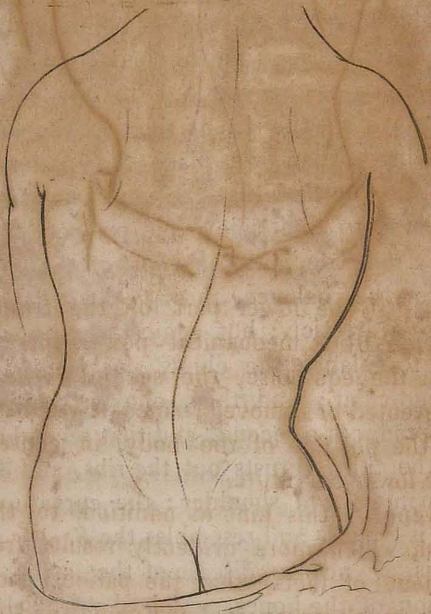
Young women at the age of puberty are very subject to a weakness of the spine; which, if it can be supported until the constitution is formed, is after-

afterwards in less danger of sinking. When first consulted, it may happen, that the spine is not observed to be in fault, only the shoulder and breast of one side is observed to be higher and more prominent than the other. We shall, however, trace this to a projection of the ribs of that side which pushes out the shoulder; and finally, on examining the spine we shall discover, that it is a sinking of the vertebræ to one side, which has thrown out the ribs of the opposite side.

Further, when we place the patient naked before us, we find that the vertebræ of the loins have sunk to one side; this projects the trunk to the same side, but the effort of the muscles to restore the balance, throws the chest in an opposite direction; but again the muscles are at work to balance the chest, and bring it to the perpendicular; and thus, one curvature of the loins produces a second, and that second a third; and the third thrusts out the ribs, and displaces the mamma and shoulder: the curvature of the spine is lateral, and resembles the *S*.

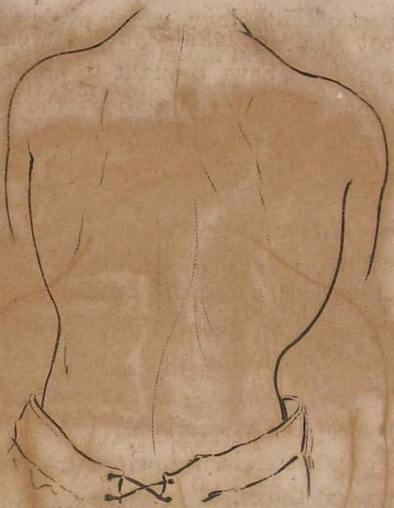
This is not a disease of the spine, but an affection of the bones, which shows itself in the softer bodies of the vertebræ. I remind my reader of this, that he may avoid raising an apparatus upon the haunches, which while saving the spine may distort the pelvis. Whatever instrument may be used to support the head, and gradually to relieve the vertebræ, must be either supported on the chair or come from the roof of the chamber. It is undoubtedly possible to do

do a great deal by taking off the weight from the spine; and I have thought it possible to do good by poising the trunk, so as the better to counteract the inclination of the column of the vertebræ. The first curve as I have said is thus:



Being an inclination of the body from the sinking of the lumbar vertebræ laterally. If, in this stage, the body was prevented from inclining, the second curvature would not take place, for the second is a consequence of the first.

Thus,



Thus, if the lower part of the trunk were supported by a mechanical power operating to sustain the equipoise, the second curve would be prevented or removed; since it results merely from the position of the body, in consequence of the lower curvature.

I venture this hint in addition to the conclusion, which more evidently results from the statement of facts, that the patient should be kept as much on an inclined plane, and at rest, as is consistent with health.

It is further evident from the effect of habit and posture on the soft spine, that much attention should be paid to the manner in which the patient lies in bed; to the position of her seat in regard to the fire, and the direction of the light, while she is at work, &c.

That

That part of Pathology, which explains the diseases of the spine, and the effects of injuries of the vertebræ, is very important. We find the spine to be a column composed of many bones jointed and united by ligaments. We find that while the column has to support the weight of the head and trunk, it is at the same time capable of a certain slight degree of motion betwixt its individual bones. Above all, we can never forget that it is a tube protecting a prolongation of the brain, the spinal marrow. We find that besides the tube of bone, the spinal marrow is surrounded with a sheath, as a further protection.

Considering these circumstances, we see a strict analogy betwixt the effects of disease and injury of the vertebræ, and of the skull; in both instances the high importance of the subject results from the nature of the contained parts. The brain suffers concussion in every shock given to the head; compression and injury from fracture of the skull; inflammation and suppuration from disease or death of the bone or of the surrounding membranes. So does the spinal marrow suffer from a blow on the spine: so is it bruised or compressed when there is fracture of the tube of the vertebræ: so is it inflamed or compressed when there is caries of the bone or disease of the membrane; while it is exposed to further injury by dislocation of the vertebræ.

OF FRACTURE OF THE SPINE.

I have had an opportunity of examining by dissection one instance only of FRACTURE of the BODY OF THE VERTEBRA. The bodies of the vertebræ are not fractured by blows, but by falls, in which the whole body is twisted, as when a bank of earth falls upon and buries a man. This fracture will not be known by the crepitation like a common fracture of the limbs, but only by the derangement of the projecting spinous processes; while yet they are not separated as in dislocation, nor crushed and crepitating as when they are themselves fractured, or as when a blow upon them has crushed in the arch of bone.

A. B. The body of one of the dorsal vertebræ fractured.

C. The portion of the bone which was forced in upon the spinal marrow.

D. A specimen may be seen in my Collection, where the patient lived till the bones were united.

I have

I have given above a sketch of the parts in the instance I examined, and it is seen how the body of the vertebra at A is broken, while the intermediate tough and ligamentous substance B is entire; it will be seen too how the point of bone C is forced against the spinal marrow D. The crushing of the bones hurts the soft substance of the spinal marrow, although that body appears entire, being covered with its tougher sheath. *

I believe that the force which fractures the bone will at the same time destroy the spinal marrow, and the effect will be paralysis of the lower extremity, and in the end death.

The substance or bodies of the vertebræ may be said to be fractured when a bullet lodges there. Gunshot-fracture is a desperate and generally fatal case; for if the ball has entered from before, it must have passed through the viscera of the thorax or abdomen †, and if from behind it must have injured the spinal marrow. If it has entered by the side into the bodies of the lumbar vertebræ, it may lodge there without being fatal, and may drop from its place after inflammation and suppuration have reduced the patient; but the chance is, that by the concussion of the spinal marrow or breaking up the tube of the spine into splinters, the injury will prove quickly fatal.

If the spinal marrow be cut through by a bullet, a man may live a longer or shorter time, accord-

* Another example may be seen in my Collection.

† See an example in my Collection.

ing as the division has been made in the loins or higher, as in the neck. If the division has happened in the loins, there may be only paralysis of the lower extremities, and insensibility of the bladder and rectum. If higher up, the bowels will suffer more by distension. If the division has been made high in the neck, the patient will die suddenly from the supply of nerves to the muscles of respiration being cut off.

Besides fracture of the bodies of the vertebræ, and fracture by gun-shot, there may be fracture of the arch of the vertebra, which forms the tube for the spinal marrow. A man falling backward and having his spine curved and projecting, may, by hitting a stone, fracture and beat in the arch of bone; or, supposing that he is driving a carriage under a gateway, stooping, thinking to avoid the arch, but does not, he strikes the same part of the chain of spinous processes againſt the arch, then the blow breaks the tube of the vertebræ and forces in the tube and spinous process, so that he becomes paralytic in all the lower part of the body.

In whatever way the vertebræ are broken, the danger of moving the body must be apparent, since in every change of posture, or turn of the body, the broken bones may be thrust against the spinal marrow. Looking to the anatomy as our only guide, we see no reason why in fracture and depression of the tube of the spine, the surgeon should not make an incision, and draw out the fractured portions, and elevate the arch! But when we

turn our attention to the real circumstances of the case as it has actually presented itself in practice, we find the bones have been crushed, the swelling general, and the paralysis complete. If this paralysis proved that a piece of bone stuck in the spinal marrow, then we might proceed to operation. But as a blow less than sufficient to crush the spine will by concussion produce the paralysis, we are tempted to wait and hope. But if the bones are evidently crushed in upon the spinal marrow, then raising the bone will not remove the injury to its substance. In short, the uncertainty of the circumstances of the case, joined to the little probability that the operation would do good, supposing that the bone has been crushed upon the spinal marrow, or has entered its substance, deters us from laying open the canal, the more especially as we have the chance of doing more mischief than good.

When called to a patient in this situation the surgeon carries a catheter with him to draw off the urine, because he knows that the sensibility of the bladder is destroyed, and that there will be, in a short time, an accumulation of urine. There will come flatulent distention of the abdomen too, and vomiting or hiccup, and which (in this case terrible symptoms) we can only palliate by ordering very stimulating clysters, and frequent friction of the belly. If the patient survives the first shock, the insensibility of the hips and lower extremities will allow him to lie pressing the hips and nates till they mortify. This mortification and ulcera-

tion

tion on the sacrum may be accelerated by the insensible discharge of fæces or the dropping of the urine, and consequent moisture of the bed. After this the patient soon sinks.

OF THE DISLOCATION OF THE VERTEBRÆ.

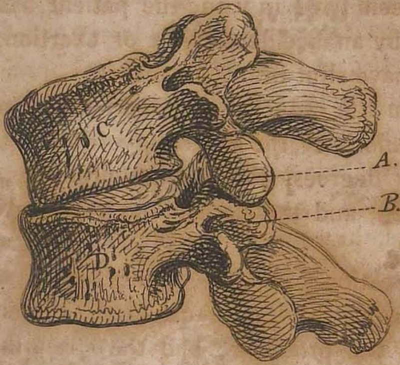
Dislocation cannot take place in the vertebræ of the back and loins, I imagine; from the circumstance of the ligamentous connexions being fully stronger than the bone. But a species of sublaxation may certainly take place in the lumbar vertebræ. This is a dislocation of the articulating processes, but not of the bodies of the vertebræ, the intervertebral substance being only a little irregularly stretched.

This derangement of the bones may be a consequence of the distortion of the body in wrestling or tumbling, or of a weight falling on the shoulders, when the body is bent forward. By this means the ligaments already stretched are torn up, and the vertebræ stand thus:

A The articulating process of the upper vertebræ. B The articulating process of the lower one. These, it will be observed, should lie flat on each other, instead of which their points stand opposed, so that the bodies of the vertebræ C D cannot come into their regular approximation, but stand with oblique surfaces.

Plan

Plan of dislocated Vertebræ.



From what is here expressed the symptoms which characterise the accident may be learned. The person is bent down, and unable to elevate himself; there is a projection of the spine, and there is an unusual space betwixt two of the spinous processes.

The reduction of this dislocation is by no means easy to accomplish. We cannot turn and twist, nor yet stretch the body, as we would an arm or leg. Was our strength equal to it, there is danger, where we have the soft spinal marrow within, and where

where the strong connexions of the processes are already lacerated. The older surgeons have recommended that the patients should be put over a barrel, and that the body be then bent forward until the processes of the vertebræ are disentangled. It has happened that after all methods have been tried in vain, the patient has been relieved by an accidental jolt or exertion, and the bones have slipt into their places.

When the reduction has not been accomplished by the efforts of the surgeon, yet in length of time and by degrees, the spinous processes have approached, and the patient has regained the erect posture.

Dislocation, I imagine, cannot happen in the vertebræ of the back, because of the firmer articulation of the processes, and the strength of their attachment by the double articulation of the ribs. But we may have subluxation in the vertebræ of the neck. A man, having slid off a hay-stack, fell on some loose hay that covered the ground; the skull was not injured, but he never recovered the shock, and died of the concussion. In this man I found that I could introduce my fingers betwixt the third and fourth vertebræ of the neck; and on opening the tube of the vertebræ a great quantity of fluid blood flowed from the spine and base of the skull. These, I believe, will generally be the circumstances attending the subluxation of the vertebræ of the neck, *viz.* that the shock of the head and spine will destroy the patient, and that the symptoms of concussion will be aggravated by

by the blood effused from the ruptured vertebra veins.

But another effect may be the result of a lesser degree of injury to the ligaments of the spine, when the neck is thus twisted under the pressure and falling of the body. The whole soft parts around the bone, and within the canal of the vertebræ, may be so injured that there may arise a thickening of the sheath of the vertebral canal, and consequent pressure of the spinal marrow; or I have thought that the injury to the spinal marrow may produce a slow disease in it, which at last destroys its function, and makes all the body below paralytic. If a train of symptoms, ushering in paralysis, should succeed to a twist of the spine or to any kind of injury, we shall be led to employ all such means as are proved in caries of the spine to be effectual for removing the deep-seated disease.

OF DISLOCATION.

Luxation or dislocation is the displacement of the articulating surfaces of the bones. Dislocation is the consequence of a twist of the limb, not the effect of direct injury to the joint which is deranged. Mistakes, both in the diagnosis and in the efforts to reduce the bones, will arise from overlooking this very obvious fact. There is a division of dislocation

cation into kinds. DISLOCATION implies that the articulating surfaces of the bones no longer correspond in any degree, that the bone is entirely displaced; as when the head of the humerus lies in the axilla, or the head of the femur has been forced from the acetabulum, and lies on the back of the ileum. SUBLUXATION is the derangement of the articulating heads of the bones, while yet they are in contact and rest against each other. The entanglement of the articulating processes of the vertebræ of the loins is a subluxation: there may be a subluxation of the knee, or more frequently of the ancle joint.

Then we have the distinction of simple and compound dislocation, analogous to that of simple and compound fracture. In compound dislocation there is a wound penetrating to the joint, with dislocation of the bone; and it is dangerous, as there is united an inflamed and suppurating wound of the soft parts with the wound of a joint, which consists of parts widely differing in economy, parts slow to inflame, but of which the inflammation when excited is violent in degree.

Diastasis is a mere separation of the bones.

There is yet another distinction, viz. into old and recent dislocation. This is a distinction sometimes important to the surgeon, for he has to consider the consequences of the bones remaining long displaced before he determines on attempting to reduce the dislocation.

I need not remind my readers of the nature of the ligaments and cellular substance. The liga-

 ments

ments are dense, white, strong, and possessed of little vascularity; they are of two kinds; first, such as are weak, but destined to preserve the sinovia, and to separate the articulating surfaces from the surrounding parts; these capsules are very weak. The second kind possess no elasticity, pass from point to point of adjoining bones, and are the strength of the articulation. Perhaps with these may be classed such tendons of muscles as surround the joint, and are incorporated with the capsular ligament. Now it is possible, that one side of a joint only is sprained, the stronger uniting ligaments are partially lacerated, and there is a weakness and yielding of the joint, or there is, perhaps, a subluxation. But when there is a dislocation, and actual displacement of the bones, both the capsular and uniting ligaments must be torn; sometimes in the whole circle of the bones, always for more than one half the circumference of the head of the bone. From this it follows, that there cannot be a noosing of the head of the dislocated bone in the slit of the capsule, as some have imagined to be the case, when the reduction has proved difficult. (See further under the head of dislocated shoulder.)

In dislocation, then, the head of the displaced bone lies among the cellular membrane, and is either lodged betwixt the muscles, or presses upon a bone. Where the smooth articulating cartilage is in contact with the cellular membrane, it presses and condenses the cellular membrane so that it becomes a substitution for the natural capsule,

while

while the torn capsules and ligaments adhere to the surrounding parts. If the head of the dislocated bone presses on a flat bone, as the os innominatum, or scapula, an imperfect articulating surface is at last formed. In the mean time, the head of the bone no longer resting in the natural cavity, the surrounding soft parts encroach upon the cavity, and adhesions form a partition betwixt the head of the bone and its former place. Besides, there is another unfavourable circumstance, the muscles adapt themselves to the state of the bones, and are permanently shortened, so that they strongly resist the reduction.

The meaning of the distinction into recent and old dislocation will now be understood. When the dislocation is of long standing, before it can be reduced the new adhesions are to be torn up, and violence must be done to the limb, as great, perhaps, as that which caused the first displacement of the bone: while in a recent dislocation there is no obstruction to the reduction but in the muscles, or natural ligaments.

In speaking of the degrees of derangement of the joint from violence, it is proper to mention sprains, and to explain that degree of weakness which remains after them.

A sprain is a momentary derangement of the articulating surfaces of bones, by which a stress is put on the ligaments, and those of one side are either partially torn, or they are stretched so that they inflame. In every sense of the word I deny that the capsules and ligaments of a joint are insensible

sensible — sensibility to pain is the grand safeguard to the body; and, although the joints do not feel in the same manner and degree with the skin and superficial parts, yet they have that degree of sensibility which suits their condition; is there not excruciating pain when a man sprains his ankle? and yet the pain is not in the skin, it is quite different from the shock of a superficial part; and except the skin, there is nothing to suffer pain but tendons, and sheaths, and ligaments, which physiologists say are insensible. Physiologists have erred, because they have not perceived the end of this sensibility, and the variety in kind, as well as in degree, which is suited to the functions of the several parts. If the end of a bone, and the capsule, were sensible as the skin or eye, or other delicate organ, their common and necessary function would lay the foundation of inflammation, a greater degree of sensibility would be the consequence, and the evil would increase until the mobility of the joint were destroyed. In the common and necessary motion of the joints there is no sensation, no injury from the friction of the parts. But if, in the violent and irregular motions of the joints, there should be no sensation communicated, then would there be an absence of the governing principle, and no restraint, and no means of renovation. We may see now, why, in experiments on the tendons and ligaments by pouring acids upon them, and pricking them with needles, the animal gives no sign of pain; and yet in sprains, and dislocations there is extreme

 torture;

torture; — we wonder only that the distinction should have been overlooked.

To preserve the natural state of a joint that inferior degree of activity of vessels only is necessary, which, perhaps erroneously, we call a weak action.

However, it is important to observe, that whenever this natural state of action is changed, there is also a change in the nature of the part. The pain I have described is followed by its usual effect, inflammation: the ligaments when inflamed lose their density and firmness, they swell, become weak, and acquire a new kind of sensibility, and no longer bind the bones with their former strength. This is the explanation of the weakness of a joint after a dislocation or a sprain: without this increased activity of vessels there could be no regeneration of the ruptured parts; injury to a joint would be like the breaking of the parts of a machine which possess no property of restoring themselves. Nothing, however, is more difficult, than to change this low degree of continued inflammation, and to restore the state of the parts to their natural density and firmness. In the scrophulous constitution there is, unfortunately, a tendency to this inflammatory action in the joints, which it is very difficult to allay. It is not bleeding and purging which will reach a local disease of this kind; far less will this do good if there be any constitutional tendency to scrophulous actions. We may take a hint from quacks and bone-setters; I have known them remarkably successful by employing

ploying severe and continued irritation on the surface, while they have forcibly moved the stiff and pained joint. But this has been after the surgeon has exhausted the patient by ineffectual applications, or, in other words, after all active inflammation has subsided.

To ascertain the nature of the accident when we have reason to think there is dislocation, we must consider these points:

1. We, perhaps, find the joint much discoloured, and marks of a blow received upon it. This implies, though it be no absolute proof, that the bones are not dislocated, but only the joint bruised; because, as I have said, it is the long lever of the bones receiving the force upon the extremity distant from the joint, which does violence to the connecting ligaments. For example, if there has not been a blow on the shoulder, but the patient falling on the wrist, has pain and lameness of the shoulder joint, then sprain or dislocation of the shoulder is the probable cause of the pain and incapacity; if, on the contrary, there shall be evident marks of a bruise on the shoulder, it is probably not a dislocation.

2. The knowledge of the natural form and position of the limb will often enable us, with a glance of the eye, to discover the distortion caused by dislocation. Generally the limb is shorter, though sometimes it is lengthened; when with this there is joined a stiff and awkward position, from which the limb is not moved without great pain, and when, upon examining it more parti-

particularly, there is a rigidity of one set of muscles, the dislocation is ascertained. We consider the new position of the head of the bone; the effect of this change on the muscles inserted into it; we feel those muscles, and they are rigid like cords; and this, with the circumstance of the accident having produced this immediate consequence, is decisive of the nature of the case. There may occur a contraction and stiffness of the muscles from spasm, producing a resemblance to the unnatural position of the dislocated limb, but there will not be the actual distortion proceeding from the new position of the bone, and the change in the angle of insertion of the muscle; there will be no shortening of the limb. In dislocation, the motion which is allowed to the limb is often interrupted and unequal. There is also a particular checking, occasioned by the head of the bone striking against a flat surface, not rolling in its natural socket. But let us recollect, that there may be a roughness and impeded motion in the joint, occasioned by inflammation having diminished the natural secretion of sinovia, where there is no degree of dislocation.

Another diagnostic may be sometimes found in the pressure of the displaced head of the bone.—I not only mean that we may sometimes discover the displaced head of the bone, but that the effect of its pressure on the neighbouring parts declares to us its new position: as for example, when the head of the humerus, resting in the axilla, presses on the nerves, or artery, or causes numbness of the

hand

hand and arm, or weakness in the pulse at the wrist.

Before we attempt to reduce a dislocation it behoves us, in a particular manner, to think of the position in which the patient stood, and the nature of the force which displaced the bone. It must be very evident, that the bone ought to be brought to the same position in which it received the impulse which dislocated it, before it can be easily reduced. We shall find examples as we proceed, where the ligaments impede the reduction, owing to the neglect of this plain rule.

The muscles too will always, in a certain degree, impede the reduction. On attending to the origins and insertions, or, in other words, to the action of the muscles, it is possible, by bending the joints, and relaxing the flexor muscles, to free the head of the bone from its confinement. It is a commonly received opinion, that the ac tion of the muscles is not always direct against the elongation of the limb, but that they bind the heads of the dislocated bones together, so that the processes of the bones check into each other, and absolutely prevent any degree of direct force from disentangling the seprocesses, or stretching the limb.

Next in importance to the relaxation of the muscles, and the due direction of the shaft of the dislocated bone, is the providing of proper laques; but especially applying them well, and to their proper place. The two bones, whose surfaces are dislocated, must, if possible, receive the whole force. To reduce the shoulder joint, the chief difficulty

difficulty is to secure the scapula; and the efforts to reduce the dislocated thigh bone are often ineffectual owing to the pelvis being left free, and only the other thigh secured.

It is customary, and right, to fatigue the muscles of the limb before the full effort is made to reduce the bone. The tackle is pulled tight, and the force gradually increased; the surgeon feels the progress of the head of the bone, and directs the efforts of the assistants; and by rolling the head of the bone, and sometimes by lateral pressure, (such as may serve to disentangle the processes of bones,) he assists their efforts: or, when the bones have been brought as near to a correspondence as the direct pulling on the limb will affect, by a sudden effort he changes the angle of the joint, and with the power of the long bone, as a lever, reduces the dislocation.

The marks of the reduction may be learned from what I have said of the signs of dislocation; or they may be summed up by saying that the limb is brought to its natural state, and the patient suddenly gains the power of complete motion. The bone will often return with a distinct and audible jirk into its place, such as might be expected from the smooth round head of the bone being drawn over the margin into the well-lubricated hollow of the socket. The freedom from the painful and unequal extension of the muscles, makes the patient satisfied that the bone is reduced, before the surgeon can be aware of it.

The

The mechanical power of the double pully ought to be preferred to the force of many assistants, from its being so much more easily managed and directed. But let it be remembered, that the surgeon may make a miscalculation of this mechanical increase of power very hurtful to the patient.

DISLOCATION OF THE CLAVICLE.

Although the clavicle be united to the sternum by strong ligaments, yet it is a weak joint, seeing that it is small to bear the weight, and allow the free motion of the upper extremity. In truth it is the weakness of the bone more than the strength of the joint that prevents the dislocation of the clavicle at the nearer extremity. When the clavicle is dislocated from the sternum the nature of the accident cannot be mistaken. The intention in the treatment is also sufficiently evident.

The shoulder is to be bound moderately back, and the arm slung, whilst a compress is to be put on the clavicle, and the roller brought round from under the arm-pit of that side obliquely across the shoulder and side of the neck, in order to press down the end of the clavicle into its place.

The clavicle is sometimes dislocated from its connexion with the acromion scapulæ. This dislocation may at first sight be mistaken for a dislocated humerus, until the nature of the injury being understood, we find that the force used has not been such as is likely to turn out the humerus from its place. And although there appears to be at

at first that hollow under the projection of the shoulder which implies the dislodgement of the head of the humerus from its place, yet presently we discover that this is only occasioned by the comparative projection of the scapular end of the clavicle; or rather more strictly speaking, that the shoulder has fallen nearer to the breast, while the clavicle is left with its further extremity projecting; we find that the humerus admits of easy and uninterrupted motion.

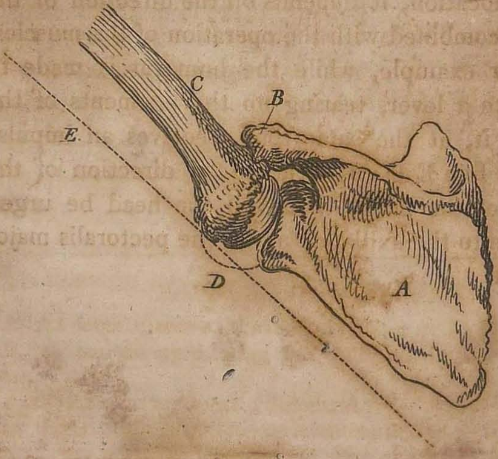
I have said that the clavicle projects, yet properly this is rather the receding of the scapula and humerus, which are now no longer kept off the breast by the clavicle. With more propriety therefore in this instance, we should term the accident the dislocation of the scapula than of the clavicle, as the clavicle remains in its place. The operation is to replace the scapula: this is to be done by holding the arm and scapula in due relation to the clavicle until the spica bandage be applied over the shoulder joint. We then suspend the fore-arm, and put a pad in the armpit to keep the scapula at its proper distance from the sternum.

DISLOCATION OF THE HEAD OF THE HUMERUS.

It is not in general a shock communicated to the joint which dislocates the humerus from the scapula, but a twist of the arm. If, for example, a boy stands holding a horse by the bridle, and the horse tosses his head, then the boy's arm is raised,

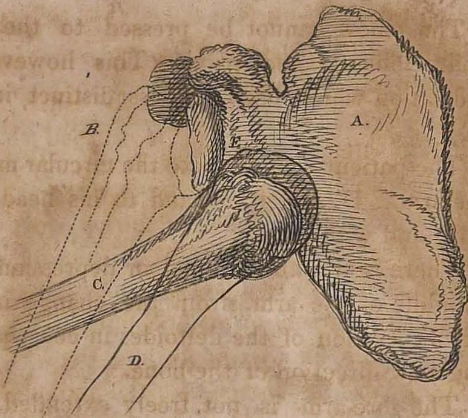
and the head of the humerus is displaced from the glenoid cavity of the scapula. Or, again, if a man slip his foot and fall, and if to save himself he stretches out the arm, then the full weight of the body being sustained by the hand, and operating with the advantage of the long lever of the arm, it turns the head of the humerus off the articulating surface of the scapula.

It will be remembered, that the very free motion of the scapula is the safeguard of the shoulder joint; for the scapula following the motions of the arm prevents the arm bone from rising to an angle with the glenoid surface, which would in a manner facilitate dislocation. This gliding motion of the scapula keeps the humerus, even in its highest elevation, still perpendicular to the glenoid cavity.



The

The position of the arm favourable to dislocation is when the arm bone is raised to its utmost limits, and until it be checked by the acromion process of the scapula. The bones then stand in the relation to each other that is here represented. A is the scapula. B the acromion scapulæ. C the humerus: while D may represent the lower part of the capsule. If the arm be thus far raised, and there is a force suddenly raising the arm further, a spasmodic action of the muscles inserted into the scapula fix that bone, and then the arm bone, C, comes in contact with the acromion process, B, as here represented, and the force operating on the long lever of the arm, the head of the bone bursts through the capsule, D; tears the ligaments of the joint, and lodges in the axilla. Indeed, as to the place of the head of the humerus in dislocation, it depends on the direction of the force combined with the operation of the muscles. If, for example, while the humerus is made to act like a lever, tearing up the ligaments of the joint, it, at the same time, receives an impulse in the line E D; that is in the direction of the shaft of the bone, then will the head be urged deep into the axilla, or under the pectoralis major muscle.



THE SIGNS OF DISLOCATION of the shoulder are these:

1. There is a hollow in the middle of the deltoid muscle, and directly under the acromion process; because the head of the humerus is removed from the glenoid cavity of the scapula, and no longer serves to give roundness to the shoulder.

2. The head of the humerus is to be felt in the axilla.

Explanation of the Plate.

A, the scapula, seen on the inside.

B, an outline representing the humerus in its natural place.

C, the humerus represented dislocated.

D, the humerus in outline, representing the consequence of pressing the elbow to the side, viz. that the head rises and presses against the neck of the scapula.

3. The

3. The elbow cannot be pressed to the side without difficulty and pain. (This however is an indication which becomes less distinct in old cases.)

4. The patient cannot make the circular motion of the arm. He raises his hand to his head awkwardly, and with pain.

5. There is an unusual bend or depression near the middle of the arm, from the change in the angle of insertion of the deltoides in consequence of the new direction of the bone.

6. The fore-arm is not freely extended, and there is a tenseness in the biceps muscle. This proceeds from the origin of the long head of the biceps retaining its hold on the hedge of the glenoid cavity, while the tendon being engaged in the groove of the humerus must follow that bone, and consequently draw upon the belly of the muscle.

7. There is a numbness of the arm sometimes, and the pulse may be oppressed, or there may be œdema of the arm. This arises from the head of the humerus pressing on the axillary artery, or veins, or plexus of brachial nerves, and depends therefore on the accidental position of the head of the bone.

POSITION OF THE HEAD OF THE HUMERUS.

1. No force can be applied in a direction to dislocate the humerus, and push its head behind the scapula, for this very evident reason, that the

the chest prevents the necessary position of the humerus.

2. Neither can the arm bone be dislocated upwards, because of the protection afforded to the joint by the prominence of the acromion and coracoid process; but chiefly, I believe, this is to be taken into consideration, that there can be no twist given to the bone when the arm is by the side, consequently the ligaments are not burst up.

3. But the head of the bone may be lodged forward, that is, the arm may be bent backward, the ligaments burst up, and the force such as to direct the head of the humerus under the pectoral muscle.

4. Downward, or downward and forward, is the most common position of the head of the humerus when dislocated. The reason is already explained, viz. that the arm can be extended in the opposite direction, that is upward and outward, and in that direction there is no check to the motion of the humerus but in the processes of the scapula: which, however, being unequal to resist the force of so long a lever as the arm, serve only to throw the head of the humerus off the articulating surface of the scapula, and to tear up the ligaments of the joints.

OF THE REDUCTION IN SIMPLE CASES.

We shall not at present stop to consider whether there ought properly to be any distinction made

made in dislocation of the shoulder joint, but merely observe, that often a slight force by the hands of the operator is sufficient to reduce it. The cases of difficulty I hope shall presently be explained.

The patient is seated in a chair; a table-cloth is put under the arm-pit and round the chest, while the ends are tied to some secure post or bench; a hand-towel is then put over the shoulder so as to press the acromion and scapular end of the clavicle; the ends of this cloth are put round the larger table-cloth, where it crosses the back and breast; they are drawn tight there and secured.

Something in form of a noose is now put above the elbow joint, and perhaps a hand-towel is the best thing we can use. It is twisted like a rope, and then applied in the form of a sailor's knot, in such a manner, that the more the ends are pulled the more securely it grasps the arm *. It must take firm hold of the condyles of the humerus. An assistant standing a little above the level of the patient takes hold of these laques, and pulls gently at first, increasing the force gradually to the utmost. When the arm of the patient is somewhat fatigued, the surgeon takes hold of the arm with the right hand, placing the palm of his left on the top of the patient's shoulder; he directs the dislocated bone into that line in which it was dislocated,

* It is a knot formed by twisting the cloth into two nooses, through which the arm is put, and on drawing the ends we have the firmest hold possible.

cated, *i. e.* elevated and a little backwards; and increasing the force, he brings the arm round until its direction is forward and upward, when the bone will be in general reduced. The reduction is known by the audible jerk which the bone makes; by the immediate ease of the patient; by the hollow under the acromion being filled up, and by the easy motion of the arm being restored. During this operation it may be useful to bend the elbow joint, and use the fore-arm like a lever to roll the humerus, which will in the first instance serve to disentangle the head of the bone from its new connexions, and in the course of its motion towards the glenoid cavity facilitate the tubercles passing the edge of the scapula.

When the humerus is drawn out to that degree that the head is nearly on a level with the glenoid cavity of the scapula, and yet it does not slip into its place, we must vary the position of the arm by drawing the arm more upward, or what is the same thing, by allowing the shoulder of the patient to drop more, and the upper part of the trunk to fall a little to the side.

Though I have found, that when the head of the humerus lodged against the margin of the glenoid cavity, that it was reduced by suddenly depressing the elbow, and lifting the head of the bone with my fore-arm, pressed upwards into the axilla, yet I can see strong objections to this mode; often instead of facilitating the reduction, this position of the humerus directly opposes it. I shall first state the fact of the great difficulty which some-

times

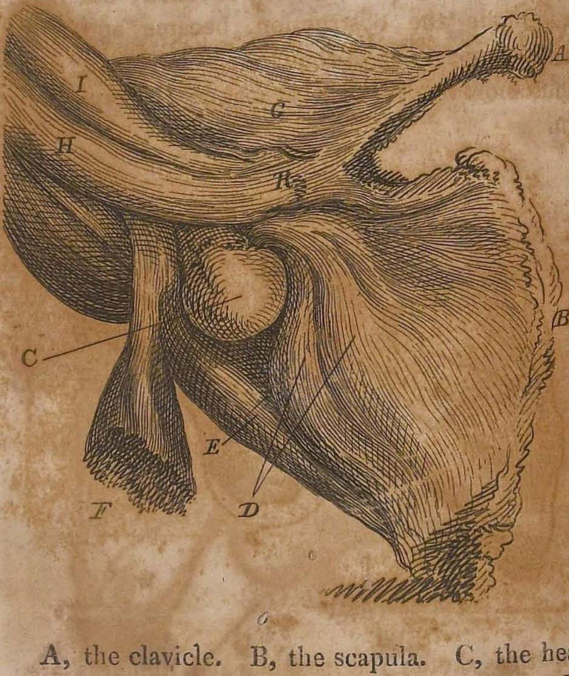
times occurs to the reduction of the dislocated shoulder, and then explain it from the consideration of the anatomy.

We are told that cases have occurred where no effort has succeeded in reducing the humerus, until by some unintentional motion, and by accident, the head of the bone has slipt into its place. What are we to think of this? not that the reduction is an *accident*, and that we are to move the arm in various directions until by a lucky chance the dislocation is reduced! A little further enquiry teaches us that there is a certain position in which the bone resists, and one also in which it as certainly yields. I have experienced this in the living body, and produced the same effect in the dead body. I have found that upon pulling the arm directly out from the body, horizontally, that not the smallest progress was made; but that at last the patient's body yielding somewhat, the effect was, that in relation to the scapula the position of the humerus was considerably raised, and that then the head of the bone slipped into its place.

The explanation which has been given of this accidental reduction is, that the head of the humerus when it was displaced burst through the capsular ligament without tearing it intirely away; and that the head of the bone was retained noosed in a slit of the capsule, so that it could not be reduced unless the arm was brought exactly to the position in which it was when displaced. To this it has been objected, that the head of the humerus does not merely burst through the capsule when dislo-

cation

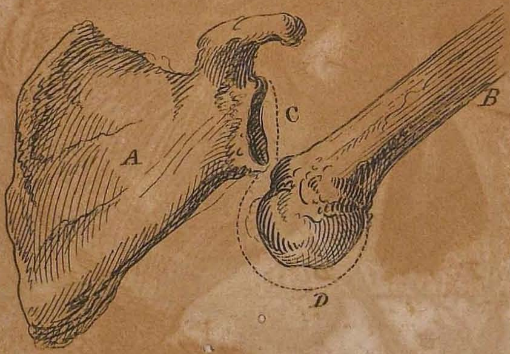
cation takes place; the capsule is torn largely away from the edge of the glenoid cavity, so that the head of the bone cannot be retained in the slit of the capsule. It has been very resolutely affirmed, that the cause of this difficulty of reduction is to be found in the muscles: that the head of the bone when it burst from the capsule was pushed through betwixt the teres major and the subscapularis in this manner.



A, the clavicle. B, the scapula. C, the head of the humerus thrust betwixt the muscles. D, the subscapularis and teres minor. E, the teres major.

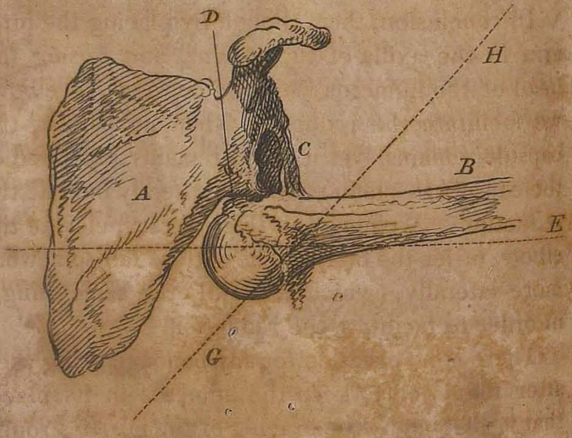
major. F, is part of the latissimus dorsi. G, the deltoides. H, the coraco-brachialis. I, the biceps.

This sketch was taken from a dissection after an experiment on the dead body. It proved more than is shown here, for on pressing down the arm bone to the horizontal direction I found that the reduction was prevented. Keeping the parts in the exact position, I cut away all the muscles, and still the humerus was retained checked; but then what made the obstruction, became apparent, viz. the upper part of the capsular ligament. But I must now explain in what manner the capsule is torn.



In this sketch the scapula and humerus are represented in the relation to each other, as if the humerus was just slipping from its position. Here it

it is evident, that as the line C, from the upper margin of the scapula to the nearest point of the attachment of the capsule to the humerus is shorter than the line D, which encircles the head of the bone, so will the side of the capsule which answers to C, be less stretched than the lower part at D, during dislocation. Indeed the upper part of the capsule of the joint is not more stretched when the humerus has slipped from the articulating surface of the scapula, than when the arm hangs naturally by the side. If in the dead body we cut the lower part of the capsule of the joint the humerus is easily dislocated, but if we cut the upper part only, and let the lower part of the capsule remain intire, it is very difficult to dislocate the bones, and not without tearing the lower part of the capsule.



In

In truth, when the humerus is dislocated this is the state of the bones and ligament. A, the scapula. B, the humerus dislocated. C, the capsule still intire on the upper part, though completely torn away on the lower and fore part. D, the rough protuberance of the head of the humerus checked under the neck of the scapula. And now it is evident, that when the arm is brought to the direction of the line E, the capsule C resists the depression of the bone, and throws up the point D, under the neck of the scapula, and the greater the force employed to stretch the arm the firmer are the humerus and scapula tied together at the points C D. But if, on the contrary, we desist from this direction of the force horizontally, and raise the arm into the direction of the line G H, then the capsule C is relaxed, and the point D escapes from under the neck of the scapula, and the bone is reduced.

In conclusion, then, though by placing the fore-arm in the axilla of the patient, and raising the head of the humerus while we depress the elbow, we facilitate the reduction when no part of the capsule remains, yet if there remains any shred of the capsule this manœuvre will directly impede the reduction. We must, on the contrary, elevate the elbow, or let the body of the patient fall somewhat more laterally, (which is exactly the same thing,) in order to facilitate the reduction.

There is no occasion for any bandage being used after reduction to keep the humerus in its place, that is effected by the bracing of the muscles round the

the joint. If any thing be required it is that some check may be given to the raising of the elbow too far from the side until the ligament has united. The surface may be rubbed with warm stimulating oils, and the arm gently and regularly moved.

In this violent operation one can imagine, that if the axillary artery were at all diseased it might be torn; but I have not known of such an accident, though I have known such an echymosis succeed the operation of reduction, as would imply the rupture of some considerable vein. I am informed that in employing the ambe in an infirmary in the north of England both the axillary artery and the muscles have been torn! so that they were obliged to amputate on the instant: one would expect that such a proof was not wanting to show that it was not the muscles but the *ligaments* which caused the very great difficulty in reducing the bone in dislocations.

Having proceeded thus far in what I had to say on the dislocation of the shoulder, I recollected that there was much ingenious observation in Mr. Hey's Surgery on this subject; I find too that there is much for animadversion. The student finds an example in that work under the head of Dislocation, of what most surgeons have experienced in their practice, a want of principle, and consequently a want of method.

In the three first cases we have an example of the easy reduction where the bone, we might almost say spontaneously, falls into its place. The conclusion Mr. Hey draws is, " that reduction might

4 some-

sometimes be effected with less extension than is commonly used, and consequently with less pain:" it appears to him, "that the muscles when so far stretched as to be rendered painful, begin to re-act and resist the efforts made for their further elongation." The fact seems to me to be still this; it is the direction of the humerus, more than the force employed, which occasions the seeming difference in the various cases of dislocation.

Mr. Hey observes, "When the head of the bone has deserted the axilla, and has slipped under the pectoral muscle, I have observed that it is brought back into the axilla the more readily if the extension is made in a direction opposite to that in which it has passed from the axilla. This effect is often greatly promoted by making the extension with the arm elevated as Mr. White has advised. But when the head of the bone has advanced far under the pectoral muscle, strong extension by closing the passage through which the protuberant part of the bone should return, often prevents instead of promoting reduction." P. 291.

The first part of this quotation resolves into the advice, that the bone must be elevated to the position in which it was when dislocated, before the force be used to extend the arm. The second part of the excerpt has, however, a reference to the opinion that the bone passes through a noose, which I hope I have shown to be a groundless supposition.

In case IV. we have these words: "The body being supported, and counter extension made by

means

means of a broad towel put round the thorax of the patient, the extension of the arm was made by three or four men, first in a direction at right angles to the body, and when the extension was in its greatest degree, by pulling the arm towards the ground at an acute angle with the body, while I attempted to raise the head of the bone by my hands placed as near it as I could. This method failed; so did that with the heel in the axilla."

So I conceive the attempt in this way will ever do, if the state of the ligament be as I have alledged. Then it will be asked, how does it happen that simply by extending the arm at right angles with the body the dislocation is so often reduced? I believe the fact to be, that the arm is not at right angles with the body in most of the cases thus reduced, but that the counter extension being made imperfectly, the body of the patient falls so far towards the assistants, who are pulling that the inclination of the humerus is changed to that direction which I have so much insisted upon as being necessary to reduction. For it is not the position of the arm, or of the patient's body, but the relation betwixt the humerus and scapula that is important.

There is a method by which the operator's neck is yoked to the patient: a towel is put under the arm-pit and over the surgeon's neck, who raises himself while the assistants pull; he thinks he assists the reduction by raising the humerus over the edge of the glenoid cavity, while he is only pressing the head of the humerus against the neck

of

of the scapula. This is somewhat more harmless, but no less unscientific, with the operation of the ambé, or the dragging by the wrist with the heel in the axilla. In all these cases it is still the locking of the bones, or the attachment of the ligament which occasions the resistance by preventing the extension of the limb.

I return to Mr. Hey's Cases: — In Case VI., after several methods had been tried, as Freke's improved ambé, that by the towel round the operator's neck, &c. he proceeds, "Mr. Lucas and Mr. Jones afterwards tried to reduce the bone by the heel in the axilla, and Mr. Lucas perceived a noise during one effort as if the bone had returned to its place. While the last method was in use, it occurred to me, that extension made in a direction parallel to that of the body was not likely to succeed, while the head of the bone lay so deeply sunk, and behind the pectoral muscle. I therefore advised, that one person should extend the arm at right angles to the body, by a hold of the fore-arm, placing his foot against the side of the patient's thorax. In this way the person making the extension would not only have a firm support, but would also be enabled to repress the lower part of the scapula by his heel placed against it. That during this extension another person lying by the side of the patient, should place his heel against the upper part of the os humeri, as near to its head as possible, and should push it in a direction parallel to that of the patient's body. By this method the bone altered its situation with

 such

such a noise as is usually heard in reductions, and we concluded that the head of the bone had re-entered the socket; but when the arm was brought close to the patient's side, we found that the head of the bone was still in the axilla. This appearance of success encouraged us however to repeat the operation, but the event was the same. We now imagined that some portion of the capsular ligament might be folded so as to be intercepted between the head of the bone and the glenoid cavity, into which we judged the bone to have been twice brought. On this supposition, after making the reduction the third time, the os humeri was moved in various directions, sometimes upon its own axis, sometimes upwards and downwards, before we attempted to bring the arm to the patient's side. Also while the extension was continued, a flattened ball of tow was thrust up into the axilla by the heel, to prevent the head of the bone from retiring again into the axilla; the arm was then brought into contact with the patient's side, &c.; by this means the reduction was completed and confirmed." See p. 297.

This is a just picture of the bustle, the varied and ill-directed efforts where there is no principle drawn from anatomy to direct the operator.

The next Case Mr. Hey gives is one where, after some ineffectual endeavours, the bone was reduced by the assistants elevating the patient by towels round the arm from his seat on the ground, and then, while the arm was thus stretched, carrying it forward.

Further experience must determine, says Mr. Hey, whether this method of reduction is superior to those which he has mentioned. Now we believe that what is called experience has kept this part of surgery in unusual darkness. Let any person take the dissected shoulder joint in his hand, and there will be no occasion for further experience to inform him that this is the best of all the methods employed by Mr. Hey. The reason I hope I have sufficiently explained already. One more observation I am led to by Mr. Hey's work; in page 304. he says, that in several of the cases the counter extension was applied so as to press back the inferior angle of the scapula, contrary to the directions given by Mr. Bromfield, who used to cause the acromion to be pushed backward. These different methods of practice, he adds, merit an attentive comparison, that it may be decided on which side the superiority lies. I hope the question is easily decided; when the surgeon pulls the arm at a right angle with the body, and at the same time pushes back the lower angle of the scapula, he brings the bones into that position which relaxes the remaining connexions of the joint, and relieves the check which impeded the reduction. The truth is I believe, that we cannot throw back the acromion, but in as much as we can do it we thereby prevent the reduction in difficult cases.

From considering the position of the head of the humerus, and the effect of the ligament, and the position of the two great processes of the scapula, it appears to me, that the motion which shall completely relax the ligament, and move the

head

head of the humerus over the brim of the glenoid cavity, is this,—let the arm be extended until the head of the humerus is felt to be drawn from the hollow of the axilla; the arm is then to be raised and moved in a circular direction towards the side of the patient's face. In this movement the neck of the humerus first bears on the acromion, and then on the coracoid process of the scapula; against the last process the lesser tubercle of the humerus bears so, that with the lever power of the humerus its articulating head is raised over the edge of the glenoid cavity, and slips into its place.

DISLOCATION OF THE ELBOW.

The dislocation of the ulna from its connexion with the lower end of the humerus happens in young people chiefly, in whom the coronoid process of the ulna is not so complete a guard to the joint as it becomes in the adult. A person who running falls on his hands and wrist, may dislocate the ulna, because the whole weight and shock is received on the elbow joint, in the line of the ulna; and in this direction the coronoid process is the sole guard against dislocation. The ulna starts backward, and the olecranon and articulating part of the ulna is thrown out behind the arm bone. The prominence of the olecranon behind the joint, and the painful rigidity of the arm, sufficiently distinguish the nature of the accident. I need scarcely add, that so firm is the union of the radius with the ulna, that both bones are dislocated when the ulna is felt thus out of place.

To

To reduce the dislocation of the ulna, the surgeon bends the arm; he puts a handkerchief round the patient's arm, and gives it to an assistant to hold, who stands behind; then with the left hand he takes hold of the arm, and with the palm of the right hand on the olecranon, he endeavours, by pushing, to restore the bone to its place. An assistant may facilitate the reduction by taking hold and pulling by the wrist, and gently bending the arm at the same time.

However, this will not always do, and a coarser and more dangerous means has been used. The surgeon has been forced to grasp the arm with one hand, and the wrist with another, and then to thrust his knee into the fore part of the elbow joint; and by this means bend the joint and reduce the dislocation. It will be observed, that the difficulty of reduction proceeds from the coronoid process of the ulna checking into the posterior fossa of the humerus, and this operation by bending, and at the same time pulling separate the bones, is the most effectual way of elevating the coronoid process of the ulna from the posterior fossa of the humerus, and of reducing the dislocation. It would, however, be a very terrible accident during this operation, to find that we had separated the apophysis, which may certainly happen in operating on a child!

SUBLUXATION OF THE ELBOW JOINT.

The subluxation of the elbow joint is when the sigmoid cavity of the ulna is forced laterally, and

 passes

passes over the prominent part of the trochlea of the humerus; the articulating surface of the ulna sits in that part of the humerus appropriated to the head of the radius.

The nature of the accident is ascertained by the circumstance of the great increase of the space betwixt the inner condyle of the humerus and the prominence of the olecranon; the motion of the joint is impeded.

To reduce this subluxation the fore-arm must be extended and drawn; while it is kept stretched, the surgeon uses lateral pressure, by putting the thumb strongly over the inner condyle of the humerus, and grasping the head of the radius with the fingers of the same hand.

DISLOCATION OF THE HEAD OF THE RADIUS AT THE ELBOW JOINT.

Dislocation of the lesser head of the radius is a consequence of a violent and sudden twist given to the wrist. It is accompanied with a diastasis of the bones of the fore arm.

The distinguishing marks of this dislocation are, that the fore-arm cannot be bent, and the rotation of the wrist is painful. The reason why the elbow joint cannot be bent, is because the small head of the radius has burst from the coronary ligament and capsule, and now stands prominent forwards, so that when the fore-arm is bent upon the arm, the head of the radius strikes against the fore part of the humerus.

To

To reduce this dislocation we pull upon the wrist, and direct the hand so as to make the force bear more on the radius than on the ulna; at the same time, by twisting the hand to pronation we pull the radius still more. Whilst this is doing, by grasping the upper part of the fore-arm as if to crush the bones together, we endeavour to force the radius into its place. We know when the reduction takes place by the flexion of the arm being no longer impeded. When the dislocation is reduced, as the action of the muscles has no tendency to retain it in its place, it will be necessary to use a bandage, to bind the fore-arm, and to keep the arm in a bent position.

DISLOCATION OF THE WRIST.

THE os scaphoides and the lunare forming a pretty regular ball are sometimes dislocated from the articulating surface of the radius, viz. the scaphoid cavity. This may happen in consequence of the wrist being twisted; but still oftener from endeavouring in a fall to support one's self on the palms of the hands; by the shock, the carpal bones are driven past the head of the radius.

To reduce this dislocation let an assistant interweave his fingers with those of the patient, and pull; the surgeon holds the lower part of the fore-arm with his left hand, with the right moves the patient's hand, and occasionally adds his strength to the effort of the assistant.

DISLOCATION OF THE BONES OF THE HAND.

As the bones of the wrist are of a wedge form, and in their union constitute an arch; the central bones are, by lateral pressure on this arch, liable to be forced from their place. By a bruise lateral to the arch of the wrist, we may thus have one of the carpal bones luxated and standing prominent. Let not the prominence formed by the thickening of the periosteum and ligament in consequence of a wrench, or blow on the back of the hand or wrist, be mistaken for this dislocation. When the bone is displaced, it may be reduced by pressure. I have been told of bone-setters who could strike them into their places with a blow of the hand.

OF THE DISLOCATION OF THE THUMB, AND FINGERS.

To the young surgeon it is most unsatisfactory to be told merely, that when the fingers or thumb are dislocated they are to be reduced and bandaged; while he finds that by using all his force he cannot reduce them. That such general expressions shall usurp the place of precise and intelligible rules of practice is much to be regretted, since it often happens that a patient returns even from eminent surgeons with his thumb still dislocated; and the thumb has been absolutely torn off at the second joint in the attempt to reduce the dislocation of the first!

From the same cause there is a difficulty to be encountered in the reduction of the thumb,

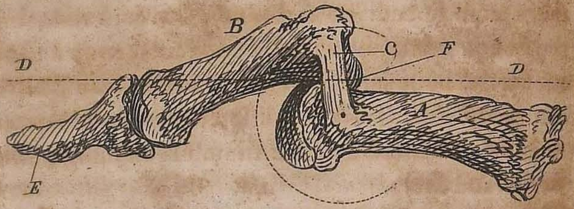
and

and of the fingers. But the bones of the thumb being shorter and thicker, and the ligaments of the joints stronger, it is only in the dislocation of the thumb that we have remarkable examples of ineffectual violence used in the attempt at reduction.

To REDUCE A DISLOCATION OF A FINGER we must not pull directly on the end of the finger; for that will be found to fix the bones by their own ligaments, so that they cannot come into their place. It is by grasping the finger forcibly, and bending it, that we shall succeed in bringing the heads of the bones into their natural relations.

We find, that in the attempt to reduce the first joint of the thumb the second phalanx has been torn off: this should convince us that the difficulty proceeds from the ligaments; for the muscles of the thumb could not bear such a degree of violence. When we have recourse to the anatomy we find, that the bones are united by a proper hinge joint; that there are strong lateral ligaments; and that the articulating heads of the bones are square, and have somewhat of a wedge form. Mr. Hey, taking these circumstances into consideration, has been led to the conclusion, that the difficulty of reduction proceeds from the head of the bone being pushed between the ligaments, in which situation the ligaments bind the bones together, and retain them locked. I should have expected that Mr. Hey would have followed up these observations with the rule of practice, viz. that we must bend the thumb at the dislocated joint, so as to carry the head of the bone which is dislocated in a semi-

semicircular movement round the articulating head of the metacarpal bone, before we can expect it to be brought through the two lateral ligaments.



I shall suppose that A is the metacarpal bone of the thumb; B is the first bone of the thumb dislocated from the metacarpal bone; and C is the lateral ligament. Now let us suppose that the hitch is put over the thumb at B, and that it is drawn in the direction of the line D D. It must follow, that the point E will rise to D, and the heads of the bones be consequently locked at F.

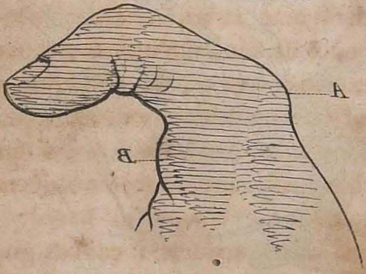
To reduce the dislocation without lacerating the lateral ligament, it is evident that the dislocated head of the bone must be moved in the circular dotted line, which is the exact reverse of its motion when dislocated.

I have a conviction, though I cannot give the proof, that by attending to the principle laid down here, the dislocated thumb may always be reduced. But should it be otherways, should a case occur where many ineffectual endeavours have been made, and the patient resists all further violence, so

so thoroughly am I convinced that the difficulty proceeds from the lateral ligaments embracing the head of the bone, that I would insinuate the couching needle under the skin (obliquely), and cut one of the lateral ligaments, when I think there would occur no further difficulty in reducing the bone. After this the joint would require to be supported by a small splint and bandage. This is a mere opinion,—a proposition to stand contrasted with the alternative of the thumb remaining unreduced and lame.

I have retained these observations exactly as they stood in the former edition. The following excerpt from my note-book will prove the necessity of connecting the anatomy with the circumstances of actual practice without which both are insufficient.

Thumb dislocated



The sketch was made after the reduction of the thumb. A, the nearer head of the second bone of the thumb started out and prominent: B, the further head of the first bone, or, as it is sometimes called, the metacarpal of the thumb.

This

This man (Æt. 55.) was drunk last night, and fell from his chair and dislocated his thumb; a student brought him to me after several painful attempts had been made in the hospital to reduce the thumb.

I pulled as others had done, but it would not do. I then bent the thumb, and at the same time pulled, still it would not do. I then stood on the outside of the arm and bent the thumb back, and pushed on the head of the bone at A, when it went softly into its place. My assistant, Mr. Shaw, has since reduced a dislocated thumb upon the same principle, but by drawing the thumb towards the palm, and pushing up the end of the first or metacarpal bone.

See next page

DISLOCATION OF THE LOWER JAW.

If when the mouth is open a man receives a blow on the chin, the jaw may be dislocated. The

The jaw being in this case dropt to its utmost limit, the angle of the jaw becomes the fulcrum, and the blow on the chin forces the condyloid process forward from its seat in the articulating hollow of the temporal bone; it starts over the root of the zygomatic process. One or both condyles may be dislocated.

The marks of the dislocation are these: 1. The mouth is open, and the teeth do not correspond. 2. On putting the finger on the root of the zygomatic process before the ear, and making the patient attempt to move the jaw, if the bone be in its place we ought to feel the prominence of the condyle of the jaw; but if dislocation has taken place there is a hollow before the ear. The coronoid process of the lower jaw is felt prominent in the cheek when the bone is dislocated. 3. The jaw is protruded forward, or is distorted. 4. Saliva flows from the mouth; the speech and deglutition are somewhat impeded.

When one condyle only is dislocated it is known by the depression being felt before the ear of one side only, and by the lateral position of the chin.

In reducing the dislocation of the lower jaw we must provide a protection to the thumbs, by wrapping a bit of linen round them, or by wearing a strong glove. The patient is seated low, and his head is held firmly by an assistant. The surgeon puts his thumbs deep into the mouth, so that they rest upon the grinding teeth, the fingers grasp the chin and base of the jaw. The back part of the jaw is to be forced downward by the strength of the

the thumbs, while the chin is lifted by the palm and fingers. By this exertion the surgeon endeavours to carry the condyle under the level of the root of the zygomatic process; which stands an eminence before the articulating surface of the temporal bone; which protected the jaw from dislocation when in its natural situation; and which now prevents its reduction. As soon as the condyles of the lower jaw are freed from the eminence of the temporal bone, the muscles of the jaw draw them into their places, and sometimes with so much spasmodic force as to close the teeth and bruise the surgeon's thumbs; to avoid which, he slips them off the grinding teeth upon the gums and cheek.

If the surgeon does not succeed in reducing the jaw by attempting to push both condyles into their place at once, he then attempts to reduce first one side, and then the other.

To preserve the jaw in its place it is only necessary to put some check upon the opening of the jaw further than is necessary to eating and speaking.

DISLOCATION OF THE HORN OF THE OS HYOIDES.

The dislocation of the horn of the os hyoides is a consequence of swallowing a large morsel. The nature of this case was discovered by Valsalva. It is attended with a sudden difficulty of swallowing, with an uneasy sensation which excites the muscles

muscles of deglutition into frequent action. There is a painful prominence of the bone, to the feeling like a tumor on the throat.

I have not seen this kind of dislocation. The manner of replacing it is by pressing and molding the parts on the outside of the throat with the fingers of one hand, while the fore finger of the other hand is put into the mouth, and as far as possible over the root of the tongue, so that the tongue, and consequently the body of the os hyoides, may be pressed forward.

I am at some loss, however, to understand how a bandage can be applied here so as to keep the bones in their due relation.

DISLOCATION OF THE CARTILAGE OF THE RIB FROM THE STERNUM.

A YOUNG man playing the dumb bells, and throwing his arms behind him, feels something give way on the chest; and one of the cartilages of the ribs has started and stands prominent. To reduce it we make the patient draw a full inspiration, and with the fingers knead the projecting cartilage into its place. We apply a compress and bandage: but the luxation is with difficulty retained.

OF THE DISLOCATION, OR DIASTASIS, OF THE BONES OF THE PELVIS.

IN the many dissections which I have made of women who have died in delivery, I have not seen one

one instance of spontaneous separation, or loosening of the bones of the pelvis. Though I have dissected three women who have died, I may say of distorted pelvis, (since the difficulty of the birth from the narrowness of the pelvis was the cause of death,) and though, after opening the womb, I have with great difficulty pulled the head of the compressed child from the bones of the mother, yet I have not found the joining of the ossa pubis loosened or relaxed. If there had been any provision in nature in the dilatability of the bones of the pelvis for the easy birth of the child, surely it must have been apparent in the only case which could require such a provision, viz. where the pelvis is distorted, and the diameters diminished.

When the symphysis pubis separates in pregnant women, a weakness and pain of the loins are remarkable symptoms previous to labour; and after delivery there is an inability of moving, or standing; all which indicate disease, and not a natural provision for easy labour. I believe then, that the separation of the bones of the pelvis may be considered as a spontaneous, but not a natural loosening of the bones; and that the force of labour succeeding to this looseness of the joinings actually bursts them up.

When the bones of the pubes separate in labour, the symptoms are, (besides what I have already mentioned,) a jarring of the bones felt during delivery; pain and fever succeeding the delivery; when the woman attempts to rise she cannot stand

or

or even sit for any considerable time; hectic fever succeeds, and she is for a long time bed-ridden. If the separation of the ossa pubis has been considerable, then the posterior symphysis of the pelvis also suffers; and if the disposition to disease be great, suppuration may take place, both behind the os pubis, so as to be discharged from the vagina, and on the hip from the sacro-iliac symphysis.

When there has been much suppuration, it is possible that the bones may at last unite, and anchylose by a medium of bone. By neglect, if I mistake not, in cases where there is less tendency to caries, this species of subluxation produces a moveable joint where there should be a symphysis, or firm union by cartilage.

I have not attended a case of *diastasis*, or separation of the bones of the pelvis; but I have ascertained, by dissection, the effects of the spraining of the joinings of the pelvis. I found an abscess within the pelvis; the ilium and sacrum were disjoined, and the cartilage was wasted, and the ligaments destroyed, and the bones extensively carious. Such was found to be the consequence of the operation of the sectio symphysis pubis when that horrid operation was perpetrated in France.

The surgical treatment of the diastasis of the bones of the pelvis, I am afraid, must be confined to the binding together the circle of the bones; for external applications, though recommended on the best authority, cannot avail nor reach the seat of disease. A broad bandage of leather softly

 quilted,

quilted, and made to draw with buckles, ought to be put round betwixt the spine of the ilium and the head of the thigh bone. This will prevent the jarring of the bones, and allay the irritation. We know how incessantly the pelvis rolls on the thigh bone, and we know how this motion keeps up and fosters the inflammation in the hip joint. So in the present instance, the perfect circle of the pelvis being interrupted, and the junctures loose, every change of posture causes a motion of the bones upon each other, and continues the injury.

Should there be a diseased joint thus formed, either in the anterior or the posterior symphysis of the pelvis, I see no treatment more likely to effect a cure than producing the counter irritation by issues.

DISLOCATION OF THE OS COCCYGIS.

By a kick, or fall, the os coccygis may be dislocated. The injury to the parts from the violence rather than the wrong position of the bone, occasions retention of urine, and pain in passing the fæcés, and it may produce abscess near the rectum.

To reduce this bone the finger of one hand is introduced into the rectum, while by the co-operation of the fingers of the other hand on the outside, the dislocated bone is brought into its place: no bandage will be required to keep this bone in its natural situation.

DISLOCATION OF THE HIP JOINT.

The dislocation of the thigh bone from the acetabulum of the os innominatum is a most serious accident; as, besides the dread naturally arising from the application of a force equal to the bursting up of this strong joint, we have to fear the wasting of the bones, or a partial destruction of the joint, and permanent lameness. Yet these consequences are apt to follow only where, besides the dislocation, the internal part of the joint has been bruised, or there is a tendency to scrophulous action in the system.

OF DISLOCATION WHERE THE HEAD OF THE THIGH BONE LIES ON THE BACK OF THE ILIUM.

The dislocation of the thigh bone upwards is marked by the shortness and strained position of the limb. It is distorted; the knee and toes are turned inward, and the thigh is bent. When we turn the patient on his belly, and bending the leg, take hold of the heel, and move the leg, (like a lever,) laterally, and at the same time put the hand upon the trochanter — we feel that the motion is interrupted and checked; and particularly when the heel is rapidly moved inward, the head of the thigh bone strikes against the back of the ilium, so that the motion of the thigh bone on its own axis is much limited. The attempt to stretch the

limb is not successful without much force, and is very painful. The head of the thigh bone may be felt as well as the trochanter, both lying on the ilium. There is pain in the groin, and a bent position of the thigh to relieve the pain and tension.

The position of the parts considered anatomically is this: the head of the thigh bone having been started from its socket lies on the back of the ilium; the articulating head of the luxated bone is towards the sacro-sciatic notch; the trochanter is more forward, and rests upon the ilium also; the capsular ligament, and the round central ligament of the hip joint, are torn; the head of the thigh bone has torn up the cellular membrane under the gluteus medius, and lies under that muscle.

A, the back of the ilium; B, the thyroid hole; C, the acetabulum left empty; D, the head of the femur;

femur; E, the trochanter major; F, the shaft of the thigh bone.

The limb operating like a long lever is in this case the cause of dislocation. When a man is pushed down on his side, and the haunch strikes the ground; when carrying a heavy burthen he falls down with the leg and thigh obliquely under him; or when, in riding, the horse falls on his side, and the rider's thigh is under the horse, the ligaments of the hip joint may be burst up, and the thigh bone dislocated. I have found a man who had been buried under a bank of earth with his thigh bone thus dislocated upwards and outwards; though most frequently I am inclined to believe the head of the thigh bone will be dislocated downward, if displaced by such an accident.

Manner of reducing the thigh bone when dislocated upwards.

If in an hospital the patient is to be laid on a strong table, which is screwed to the floor; folded blankets are to be placed under him; a soft compress is put in the perineum; if the right thigh bone be dislocated then the patient is to be on his left side, or so that he may rest on the left hip, and that we may feel and observe the position of the dislocated bone. A sheet is to be folded so that it may be laid upon the perineum, and its ends tied firmly to the table. A quilted strap is to be laid betwixt the spinous process of the os ilium and the head of the thigh bone, and the ends of this are to be fixed to the sheet. The strong leather band

band with hooks, (which are to be found in the shops for this purpose,) are to be placed above the knee that they may take hold of the thigh bone above the condyles.*

But we may have to reduce the dislocated thigh bone when we have no hospital apparatus, and therefore we must think of our means when in a private chamber. We first fix the bed, then wrap around the bed-post a sheet or blanket. The patient being laid on the bed with his thighs on each side of the post, he is then to lie down inclined towards the opposite side from that which is to suffer the operation. In this position, when the pull is made on the dislocated thigh the tuber ischii and perineum are made to press against the bed-post. The patient's body is to be kept down in this position by an assistant. It is the duty of this assistant at the same time to observe that the pelvis and trunk do not move upon the sound hip joint; for which purpose he has to lay himself on the bed, and keep hold upon the spine of the patient's ilium.

The laques, or hitches, may be made of hand-towels, and placed above the knee, so that they take hold of the condyles of the thigh bone. The knee is to be bent, and the leg and foot used as a lever to move the head of the bone in a rotatory manner. It is said, that when one of the towels is brought on the inside of the knee this ro-

* In cases of dislocation where much force is to be used, a few turns of a flannel roller should be put round the limb before fixing this apparatus.

tation

tation is impeded. I do not remember to have experienced any difficulty in reducing a dislocated thigh in this manner, though it had continued unreduced for three weeks. At the same time, if we consider the direction of the force to be employed, and the position of the thigh bone, there can be no objection to the laques being brought to the outside of the knee only.

Whilst strong men pull the thigh by the laques in the line of the body, and an assistant holds the knee and ankle to give the rotatory motion, the surgeon should be placed with his hand on the joint; he may press down the trochanter, but he will do little good or harm by his efforts there: he cannot press the trochanter down without at the same time pressing it to the back of the ilium, which must have the effect of delaying the reduction.

Sufficient elongation of the thigh I believe to be all that is absolutely necessary to reduction, but the elevation of the head of the thigh bone over the brim of the acetabulum will be much facilitated by the rotation of the thigh, especially by a pretty forcible jirk of the heel outward, when the head of the thigh bone is brought to the level of the margin of the acetabulum. No cunning exertion on the part of the surgeon is required in this stage of the operation; the head of the bone goes with an audible snap into the socket; the perfect relief satisfies the patient that the bone is reduced. He is inclined to take as little freedom in motion after reduction as can be required by the most cautious surgeon. Unless the acetabulum is

 broken

broken or diseased, there is no fear of the thigh bone escaping again from the socket.

OF THE DISLOCATION OF THE THIGH BONE DOWNWARD.

THE thigh bone is sometimes dislocated downward and forward, so that the head of the bone rests in the thyroid hole, or rather on the obturator ligament and muscle. I conceive this to be a kind of dislocation less frequent than the last, though I see observations contradicting this opinion.

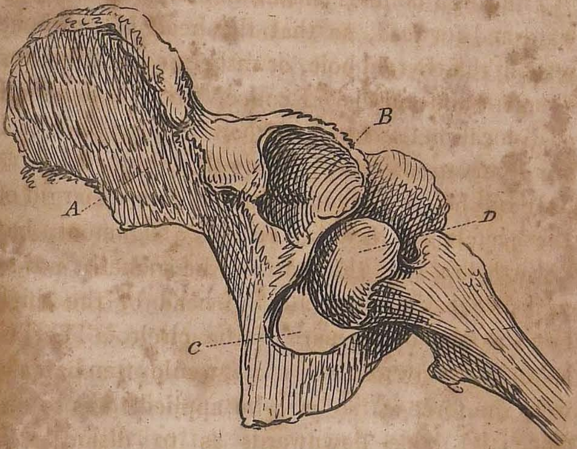
It will be recollected, that the lower margin of the acetabulum is eked out by a ligament, but nevertheless that this part of the socket is not so well calculated to restrain the head of the thigh bone as the upper part of the circle. The dislocation downwards, therefore, would often happen, were the force as likely to be applied so as to displace the bone downwards as to dislocate it upward.

When there is a resistance low on the hip, and the trunk is forcibly twisted over to the same side, the thigh bone may be dislocated downward and forward: or, when a man is crushed down by a weight on the hip, or when the foot slips from under him, so that the perineum touches the ground, the head of the thigh bone may be dislocated in this direction, viz. downward and forward. If the head of the bone is displaced by its slipping over the lower margin of the acetabulum, it must fall a little forwards and lodge on the thyroid hole.

There can be no difficulty in distinguishing this kind of dislocation from all other accidents to

 which

which the hip joint is liable; the thigh is lengthened, and the knee and toe turned outward; the limb straddles, and is with difficulty and pain brought to the line of the body.



We have the explanation of all these circumstances in this sketch of the position of the thigh bone upon the ilium.

A, the hollow of the os ilii; B, the acetabulum left empty; C, the thyroid foramen; D, the head of the femur, dislocated and resting in the thyroid hole.

OF THE REDUCTION OF THE THIGH BONE WHEN DISLOCATED DOWNWARD.

The reader might imagine, that as the limb is already too long there can be no necessity for applying

applying an apparatus to stretch it as in the last instance; nevertheless, the position, the manner of securing the patient and of applying the laques to the limb, may be the same in this case as in the last; that is, on the idea that the limb must be somewhat further stretched before it can be reduced. But it requires to be particularly noticed, that in this instance of dislocation of the thigh bone downward, the head of the bone must be lifted from the place in which it is lodged, and raised to the level of the acetabulum before it can be reinstated in the socket. It might at first appear, that by using the thigh bone as a lever, the ramus ischii being the fulcrum, it would be possible to raise the head of the bone from the thyroid hole by pressing the thigh backward and inward. But when we consider the position of the knee and toes, it is evident that the great trochanter is carried so far downward, that by this motion it would be carried under the ramus of the ischium, and that consequently the reduction would be checked and impeded.

A fulcrum, or fixed point, must therefore be supplied to enable us to operate with effect in this position of the limb and trunk.

For this purpose a large towel or table cloth is put round the thigh, and carried as near the perineum as possible. The ends of this cloth are to be held up by strong assistants. While the thigh is gently drawn so as to extend it, the cloth is at the same time raised and carried a little backward, so that the head of the thigh bone may be lifted from

the

the depression in which it lies. The thigh is then bent (by carrying the knee forward) and drawn in that direction; our last resource is to carry the knee to the ground, that is, towards the other side of the patient's body. In this operation we make the cloth which is put under the upper part of the thigh, a stay, or fulcrum, and by using the thigh as a lever we unfix and raise the head of the bone. We may, during this operation, roll the thigh by taking hold of the knee and ankle as heretofore described.

We may perhaps find reason to prefer the following method of reducing the thigh bone when dislocated downward. The patient is set upright on his breech, his thighs on each side of a strong pillar; or he may be seated on the corner of a bed, the bed-post betwixt his thighs; something soft is wrapt round the post, and a person is placed behind him to prevent him from reclining backward, and to keep him to the seat.

The extension of the thigh is accomplished by drawing it at right angles with the trunk. My reader will readily understand that by this operation the head of the thigh bone is drawn out of the hollow in which it lies, and lifted as it were into its proper socket. If drawing in this direction simply does not succeed, then the cloth is at the same time to be put round the thigh as before, so as to draw the head of the thigh bone outward, while the knees are brought together.

There is mention made of a kind of dislocation which, when looking on the subject, I should say

is

is little likely to happen,—the dislocation of the thigh bone upward, while the articulating head is forward on the ilium, and the trochanter backward; it will be characterised by the union of the two most distinguishing signs of the other kinds of dislocation, viz. the shortening of the limb while the knee and toes are turned outward.

When the thigh bone is reduced, there is little fear of its starting again from its place; all that is done on this account is to put some slight binding around the thighs to check their motion. What is to be feared is inflammation in the joint, and gradual wasting of the head of the thigh bone, of which I have lately seen a case. This I must suppose owing to some defect of constitution. I would treat it as I have recommended for the hip disease, viz. by leeching, blisters, and the warm bath.

DISLOCATION OF THE PATELLA.

THE dislocation of the patella, or knee-pan, is not a very uncommon accident. When a man falls, so that the outside of the patella is struck while the muscles of the patella are not firmly braced, and the limb is nearly extended, he may suffer this dislocation. From the nature of the accident I have described, it is implied, that the bone is dislocated inward. But it is sometimes driven to the outside of the joint.

The

The dislocation of the patella is easily ascertained by the unusual flatness of the knee on the fore-part, and the displaced patella being distinctly felt; the reduction is not difficult. The leg is to be extended, and the thumbs applied to the bone, while the fingers grasp the knee joint. If a difficulty occur, it is owing to the ligament of the patella preventing that bone from surmounting the condyle. In this case, as it is impossible to stretch the ligamentous connexion of the patella with the tibia, we must have recourse to the further relaxation of the muscles inserted into the patella, and press the patella downward before we attempt to carry it to its place betwixt the condyles.

A laced cap for the knee is to be used after the reduction, to hold the patella in its proper place of lodgment.

OF THE INJURY OF THE INNER LATERAL LIGAMENT OF THE KNEE JOINT.

THIS is an accident which I do not see noticed. I have seen it in various degrees, and have had an opportunity of ascertaining the state of the parts in dissection.

The internal lateral ligament of the knee joint must suffer in a particular manner whenever there is a stress and unusual force upon the joint from a shock perpendicular to the limb. In this plate, A, is the thigh bone; B, the tibia; C, the inner lateral ligament. The effect of a false step, in which the whole weight of the body falls suddenly with a shock in the direction of the dotted line is to sprain or lacerate the ligament C.

So it happens, that a person descending a stair, and thinking that he has come to the landing-place when one step is still to take, falls with the weight of the body bearing on this ligament, and sprains it. How this is most apt to happen to women is evident, considering the greater width of their pelvis, and consequent greater obliquity of their thigh bone: for the more removed the thigh bone is from the perpendicular, the more apt is the inner ligament to be sprained.

If

If the violence be great we can readily conceive how the ligament is actually torn, so as to produce

A SUBLUXATION OF THE KNEE-JOINT.

If this accident should occur, there can be no impediment to reduction. When reduced, our attention should be chiefly directed to restrain the rising inflammation, and to sustain the limb in its natural position by a splint and bandage.

But I am bound to direct my readers' attention more particularly to what I have seen and practised. When the inner lateral ligament is partially lacerated, or even strained only, there comes upon the part, slowly, inflammation and relaxation. The patient feels great pain in walking; the knee gradually falls inward, with increasing lameness. The yielding of the ligament on the inside of the knee joint being attended with increased obliquity of the thigh bone, the danger of further injury increases, until at every step the weight of the body bears on the relaxed and inflamed ligament.

One patient, a woman, dying after a long lameness from this cause, on dissection I found the cellular substance and lateral ligament, and capsule, on the inside of the knee much thickened. While it was thickened the ligamentous substance was at the same time stretched so that there was not sufficient guard to the joint on this side.

We understand that this thickening and inflamed state of the ligament, being a change of texture and constitution, is followed by increasing weakness, an inevitable consequence of diminished den-

 sity.

sity. The method of cure, therefore, will be, in the first place, to guard against all repetition of the injury, and to try to remove the chronic inflammation which remains. To fulfil the first of these objects requires the application of a splint along the outside of the knee, with such a bandage around the lower part of the thigh and the upper part of the tibia, as may support the joint while there is no pressure made on the injured part. When the stiff splint has been used for a time; motion may be allowed to the knee by a jointed splint applied like the former, which, while it prevents the yielding of the knee joint inwardly, allows the natural flexion. The second part of the design is accomplished by applying leeches and a succession of blisters to the inside of the knee.

DISLOCATION OF THE ANKLE JOINT.

Under the head of fractures I have explained the nature of the compound dislocation of the ankle joint, where the lower head of the tibia has burst the deltoid ligament which protects the inner ankle, and the fibula is broken a little above the external maleolus. I have only at present to make some remarks on the injury to the ligaments of the ankle joint.

1. As in the instance just now stated of the injury of the lateral ligament of the knee joint, we have to notice the consequences of the lesser and partial sprains of the inner ligaments of the ankle joint. If, in stepping on an unequal pavement, the

the ball of the great toe be not supported so as to make a balance to the heel, the foot is twisted, and the inner ligament of the joint is injured, and although not ruptured, it inflames and becomes weak.

2. I am often asked by my younger pupils what is to be done when the lower head of the tibia is actually forced from the astragalus, and the joint is laid open. Undoubtedly the practice is still to save the foot, and not to amputate. We replace the bones, and bind them, trusting that by bleeding and cold we can keep down the inflammation. No doubt circumstances of the patient's constitution and situation will qualify the rule.

3. A patient of a bad habit, and in a London hospital, will be doomed to suffer amputation, when in other circumstances he might be saved. We must too in all such cases take into consideration the degree of contusion which the part has suffered.

4. If a man in leaping from a gig has lacerated the ankle joint, the foot may still be saved.

5. If the wheel has passed over the joint, so as to displace the bones and open the joint, though in exactly the same degree, amputation will be necessary, from the general contusion of the parts.

I state the circumstances thus to prevent my reader from imagining that in any such case he is to trust to an absolute rule or aphorism, for with the same degree of laceration in the joint, the degree of *injury* may be greatly varied.

The ankle joint may be dislocated by the tibia and

and fibula slipping before the astragalus. It will be ascertained by the great projection of the heel. It is to be reduced by applying the laques so as to catch upon the heel, and at the same time to pull on the fore part of the foot, by which means the toes are pointed, and the gastrocnemius relaxed.

In closing my observations on the injuries of the joints, it becomes a duty to remind the young surgeon of the great advantage to be derived from the general healthy state of the body in the final cure of local injuries of these parts; that is, from good air most especially, from better diet than that to which the patient has been accustomed *; and even from exercise, if it can be allowed in the circumstances of the case. It becomes him to observe too, if there be any scrophulous tendency in his patient, and to endeavour to counteract it; for injury of the bones and joints, is apt to rouse scrophulous action if there be the slightest tendency to it. We are informed that the bones of scrophulous people contain a smaller portion of earth than when the part has its healthy constitution. I would not be understood to say, however, that on this account they are more susceptible of diseased action, though certainly they are more liable to be fractured, and the ligaments of the joint

* Even although the patient has been nursed in luxury and great abundance, it is possible to ameliorate his condition; though it must be confessed we possess more advantage when from the privations to which an hospital patient has been accustomed he can be put on a more generous diet.

having

having a tendency to inflame and soften, they are also more likely to be injured by sprains.

For these reasons it is necessary that we should know the characters of scrophula, that we should be able to recognize the disease under its symptoms,— the indolent swellings of the glands of the neck; the softness of the skin, and the laxity of flesh; the largeness of the joints; the light hair and fair complexion, and smooth skin; the tender eyelids and swelled lips; or the dark sooty hair, with cheeks of a broken ruddy colour, and swelled features. If there be ulcers, either previous to the injury, or in consequence of it, we find them pale, shining, and indolent, with little pain or inflammation.

If such should chance to be the constitution of a patient who has suffered injury of the bones or joints, the cure is more precarious, and certainly more tedious; the predisposition must be watched and counteracted.

The skin ought to be kept soft, and the vessels of the surface active, by the use of the warm bath and friction. The glands, and glandular viscera, may be kept free of the congestion of the indolent habit by occasional use of laxatives, and by bark, iron, or acids, for the purpose of giving vigour to the system.

OF THE MEANS PROPOSED FOR EXCITING THE OSSIFIC ACTION WHEN A JOINT HAS BEEN FORMED IN CONSEQUENCE OF THE MISMANAGEMENT OF FRACTURE.

When in consequence of some temporary debility or derangement of the economy, or of too great freedom in moving the fractured bone, a joint has been formed instead of the bone uniting, we must contrive some means of exciting the disposition to form bone. If a temporary indisposition seems to have interrupted the process of ossification, health being restored, we may the more confidently hope for success, and still more may we hope for success if motion, during the critical time of the process, has interrupted the union of the bones. Our difficulty will be greater when a fleshy substance has got betwixt the end of the bones; and I know not if we can expect success, if, by the long continued motion of the limb, the fractured bone has wasted. I have been told of a case where the greater part of the tibia wasted, and became small towards the broken extremities.

In cases where the disposition to unite is suspected, where the union of the bones is long delayed, we must put the splints more firmly upon the limb, and make the patient rise and walk if it be a bone of the lower extremity which is broken. The injury which is thus produced by the ends of the bone bearing against each other, is sufficient to rouse the activity of the ossifying process. I have heard Sir Everard Home, in his lectures, delivered in Windmill-Street, ingeniously observe that the use

use of a part is its natural stimulus to health; and as a muscle requires action to its perfection, so a bone requires to be used, that is, to be borne upon and to give support: he illustrated this idea by an example of a patient whose arm-bone he bound up, and obliged him to lean his weight from time to time upon the elbow.

It appears to me that this bruising of the ends of the bones against each other, is beneficial only as a means of exciting a renewed activity in the callus; and then it is necessary afterwards to restore the limb to repose, and to keep it supported by splints.

In the case of artificial joint, it has been proposed to cut down through the flesh, and to cut off the callous extremities of the bones. I do not recollect that this has ever been done with success, unless in the two first examples by Mr. White; but I know that it has been done with continued pain, during the operation, almost to death, and with no good effect. The thigh has been cut so that the bone has been exposed, but lying deep in the flesh, the disentanglement of the end of the bone has been found most difficult, painful, and tedious; the saw moving in these deep parts requires a large wound and moves with difficulty, and in one case, long before one extremity of the bone was cut off, the patient was pale and feeble, and incessantly vomiting from pain and irritation. I believe hours have been spent in the attempt, and what has been the result?—an extensive open wound, the ends of the bone consequently exposed, and these ends injured by the working of the

the saw. A disposition, in short, is left upon the part the very reverse of the quiet ossific action. There follows inflammation and suppuration, (ever at variance with healthy ossification;) and when the inflammation has subsided, and the parts might be expected to granulate and take the disposition to unite by bone, that disposition has been already destroyed by the violence of the inflammation, or the time for their union is past, and the bones remain loose as before.

In one case I thought myself, by observations made on animals, authorised to propose that a sharp instrument should be pushed obliquely down upon the bone, so as to work upon and penetrate the extremities of the bones. By this means I imagined the wound made by the passage of the instrument would immediately heal, and yet the extremities of the bone be so excited as to resemble the state of simple fracture more than can possibly happen after cutting down upon them and sawing their ends. But perhaps the patient reasoned better than his surgeon, since he would not submit.

I am happy in this occasion, of describing the method pursued by Dr. Physick of Philadelphia to revive the ossific disposition. This is not like what I have written, a mere proposal; but an operation successfully performed, and happy in its result as in the ingenuity shown in devising it.

The interest I had in this operation made me desirous of learning through my pupils in America, the cases recorded there, and the exact manner of operating.

operating. I received the following account. Dr. Physick has published the result of one case only*; but my correspondent sends me other instances of the success of the operation with the seton. The first case occurred in a seaman, who broke his arm after being seven months at sea. The humerus was fractured about two inches above the elbow joint, and by constant use, an almost perfect joint was formed. After much delay from the illness of the patient, a seton needle, with a skein of silk, was passed through betwixt the fractured extremities of the bone. The operation was performed on the 18th of December, and the bony union was found to be complete in the beginning of May.

The second case my correspondent relates, was of a mulatto woman of sixty-five years of age. The humerus had been fractured eighteen months before, and no union had taken place between the fragments. Dr. Physick passed the seton betwixt the ends of the bone in March, which was allowed to remain until Midsummer, when an attack of cholera-morbus and an intermittent fever induced her physician, in the absence of Dr. Physick, to remove the seton: the arm had become more stiff, and more painful, but the union was not complete. This woman submitted to the operation a second time, but I have not learned the result.

The next case which has been communicated to me, is of a man who fractured the bones of his

* In the Medical Repository.

right leg a little above the middle, and the left thigh-bone at the same time. The thigh-bone united as usual, but no union took place in the tibia, so that he was unable to use the leg. This circumstance of the union of the thigh bone, proves that at least in this instance the obstruction to the union of the tibia was not in the constitution. Dr. Physick passed the seton nineteen months after the accident, and in three months the bony union was complete.

The next subject who offered to Dr. Physick was a lady who broke her arm, the bones of which had not united in twenty-two months. In four months after the operation, the union of the bones appeared complete, but the patient was desirous of continuing it longer, which she did for seven months. The orifices healed in a week after withdrawing the seton.

Soon after receiving these cases from Dr. Physick, an opportunity offered to me of putting the operation in practice. The patient was a captain in the India service, whose thigh was broken by a contusion during an engagement at sea. I had resolved upon passing the seton, when the patient was taken out of my hands; but the operation was performed by another surgeon; the seton was withdrawn in three weeks, and the bones did not unite. I have a patient at present under my care, a boy of six years of age. He broke his leg three years ago, and the bones are not united. I have passed the seton, and expect that in due time the operation will be successful.

THE

THE OPERATION.

It is necessary to have a needle strong and round, and with a point calculated to make way through a portion of bone; a common seton needle might be broken in the attempt to pass it. The situation of the principal vessels and nerves must be well determined, and the tract of the seton calculated to avoid them.

An assistant draws and stretches the limb, while another sustains it and makes-counter extension. This, by separating the ends of the bones, gives more room to pass the needle through the elastic substance which is betwixt them.

When the seton is passed, the wounds may be bound up without any regard to position or restraint for three weeks; but at that time the splints ought to be put on and the motions restrained as for a recent fracture. The first symptom of amendment is a painful stiffness in attempting to bend the limb. We have seen that three or four months are necessary to the cure.

FRACTURE OF THE CLAVICLE.

The clavicle may be broken by a blow directly upon it; but it is most commonly broken in consequence of the person pitching on his shoulder as in falling from horseback. The fracture of this bone is ascertained by remarking that the shoulder is fallen lower and towards the breast, and, on feeling

feeling along the bone, the crepitation of the broken ends is perceived, perhaps the broken ends are found to have passed each other. The outer extremity or scapular portion is found to be most depressed.

The motion which the patient makes with the greatest difficulty, is to touch the shoulder of the opposite side, or to raise his hand to his forehead; for this motion twists the broken clavicle, and forces the broken ends into the cellular membrane.

It appears remarkable that there is no instance of rupture of the subclavian artery, or vein, by the broken ends of the bone. A degree of paralysis has been a consequence of this accident, but then it was from the nerves being involved in the inflammation consequent upon the fracture.

The indication is to keep the shoulder from falling forward and the arm from dragging. If the patient be drunk, compresses are to be put over the tendons of the pectoralis major, and a figure of 8 bandage to be so applied as to draw the shoulders powerfully back, that no struggling or thoughtless motion be allowed, which might tear the parts against the sharp bones.

When the bone is to be set, an assistant draws back the shoulder, while the surgeon examines the position of the bones; and when the broken ends have been drawn into their natural relation, flat compresses of linen or portion of soap-plaster are to be placed before the arm-pits, that the bandage may not cut the skin. The double-

headed

headed roller is now to be applied: putting the middle of the roller across the back, the surgeon brings two turns under the arm-pits and over the shoulder; then, by crossing the roller on the back and again bringing the turns to bear on the shoulders, they are retained braced back: after a few yards of the roller are thus applied, the shoulders are fixed, and the arm cannot fall forward.

Now a soft cushion, or pad of lint, is to be placed in the axilla; and, the turns of the roller being secured, the end is to be brought down upon the back and outside of the arm, so as to bear on the elbow and brace it to the side. In consequence of the compress being in the axilla, the effect of bending down the arm is to remove still further the shoulder from the sternum, and to keep the broken ends of the bones from passing each other.

If the bones come easily into their place, then the pad need not be applied in the axilla until after a time when the roller is somewhat loosened by stretching, or till it be necessary to make some substitute for the severe bracing of the roller.

When the shoulder is braced back, we must notice if the broken bones be on the exact level. And, at all events, it is necessary to sling the arm, to prevent the falling down of the outer portion of the clavicle; for this purpose the fore arm is put in a large handkerchief, the ends of which are to be tied round the neck.

No kind of compress must be allowed on the ends

ends of the broken bones, for they are ineffectual as to keeping the bones in their place, and only press the tender skin against the sharp bone. The notion of applying a compress and bandage to keep down the rising end of the clavicle has proceeded from a mistake ; the higher portion is in its place, and it is the lower portion which is fallen down by the weight of the arm. If it be found that the patient is often feeling and pressing the bone, it may be well to put a piece of leather, spread with plaster, over the clavicle, but this is merely to keep off his fingers.

Simple as this lesson of surgery must be considered by those who consider the relations of the clavicle, viz. to draw back the shoulder, and to elevate the elbow ; I have very often seen this fracture ill set. This I attribute to the lengthened description, and the very complex bandaging represented in Desault's works.

FRACTURE OF THE ACROMION PROCESS OF THE SCAPULA.

When the shoulder is black and blue, and it is found that the patient has pitched upon it, but yet the clavicle is not broken; and when there is crepitation on pressing the prominent part, and some disfiguration of the shoulder joint, we may conclude that the acromion scapulæ is broken. But the fracture of the acromion is more frequently a consequence of a weight falling on the shoulder, than of a person pitching with the shoulder on the ground.

If

If the acromion process be broken, we see, on taking hold of the arm of that side, and either pulling it down or letting it drop with its own weight, an evident sinking of the top of the shoulder: or on applying one hand to the shoulder, while with the other we move the arm, a crepitation is felt. On pushing up the arm bone, there is pain, and we see the point of the acromion unnaturally elevated.

In fracture of the acromion scapulæ (which by the bye is not a frequent accident, owing to the weakness of the clavicle, which, yielding, saves that process,) we raise the arm, and relax the deltoid muscle, and examine and replace the pieces of the bone. Then the arm being allowed to fall gently to the side, the fore-arm is to be suspended in a handkerchief so that the head of the humerus may be made to rise and push up the extremity of the broken acromion, so as to preserve it in its place. As this injury proceeds from a direct blow on the part, the pain and tumefaction of the integuments of the shoulder will be great, and no bandage can be applied with advantage until the swelling has subsided: then the spica bandage may be put on. The spica bandage is a form of applying the double-headed roller. The middle of the roller is put under the arm pit of the opposite side; then the ends are brought up and crossed on the top of the wounded shoulder; then they are crossed under the arm-pit of the same side; they are then carried across the back and breast, and the heads of the roller are again crossed

crossed under the arm-pit of the opposite side, and so are carried up on the injured shoulder again — and this is repeated until the shoulder and the broken bones are covered with a firm lacing of the bandage. It may be necessary to relax the deltoid muscle, in order to keep the bone in its place. This is done by placing a pad betwixt the arm and the side. Let it be particularly observed by the surgeon that if the acromion be allowed to unite with its point depressed, it will check the motion of the arm-bone when the patient attempts to raise it upwards. In fine, let the surgeon attend to these hints. 1. Raise the arm and replace the broken fragment:—2. Support the elbow. 3. Brace the arm firmly to the side. 4. and lastly, Let him examine, by carrying the finger along the line of the spine and acromion from time to time, to see that the broken extremity has not fallen lower than it should do.

OF FRACTURE OF THE BODY OF THE SCAPULA.

Of the other parts of the scapula, the inferior angle is exposed to be fractured next in degree of frequency to the acromion process. It may be broken by falls or blows. I have been consulted by a person complaining of a great pain in the lower part of the shoulder blade from a fall, and yet I have found that this part never touched the ground or received a direct injury; but the latissimus dorsi had been injured by its sudden action on the angle of the scapula during the twist of the

trunk, and in the exertion of the patient to save himself from falling backwards. — We shall have occasion to distinguish a black and discoloured state of the integuments, the consequence of this injury of the muscle, from the effects of a blow upon the side, or a fall.

There is sometimes a dislocation of the tendon of the latissimus dorsi, in consequence of the angle of the scapula getting over the tendon, so that the arm cannot be carried forward or lifted.

But from these injuries it is always easy to distinguish the fracture of the scapula. When there is fracture of the lower part of the scapula, we have to press the fingers around the lower angle of the scapula, as if to fix it; then, raising the patient's arm, which moves the body of the scapula, if the lower angle be broken off, we shall find that it does not follow the motion of the body of the bone. It is not practicable to bring the lower piece to answer to the body of the bone; but by managing the position of the arm, the body of the scapula may be brought to meet the fragment so as to come into accurate contact with it. To effect this, we carry the patient's elbow forward on the chest, and when we feel that the parts of the scapula correspond, we place the palm of his hand on the opposite pap and bind the arm to the chest: for this purpose the fore-arm is to be slung in a handkerchief, and pads or compresses put betwixt the arm and scapula; and then a broad roller is applied round the body, including both the chest and the arm of the injured side.

FRACTURE

FRACTURE OF THE HUMERUS.

This is the simplest of all fractures. It requires only two pasteboard splints, one on the inside and the other on the outside of the arm. The fore-arm should be hung by a handkerchief, in such a manner that the wrist may be more supported than the elbow, so that the weight of the arm, counteracting the action of the muscles, may serve to keep the ends of the bone in their proper place.

I have seen the imperfect joint formed in the arm bone oftener than in any other. This makes it necessary to put strict injunctions upon the patient to keep the arm still.

The humerus may be broken very near its head; the neck of the humerus cannot be broken, because there is, in fact, no neck; but, in a young person, the head may be broken off at the joining of the apophysis. This has been the consequence of the recoil of a musquet, when a lad, in firing his piece, has not rested it on the shoulder, but on the arm bone. This is an accident which we must take care to distinguish from dislocation.

Fracture of the humerus, near the head of the bone, is unfavourable, because of the strength of the muscle which surround it: the pectoralis major and latissimus dorsi, the deltoides and teres major, act on the lower piece of the bone, and make an essential difference betwixt this case and that of the simple fracture of the middle part of the bone. The position of relaxation (calculated to admit the reduction of the bone) is when the fore arm is bent, and the elbow raised from the side. We must, in this

this fracture, be careful to adapt a splint to the inside of the arm, with such a pad as may fill the axilla without too much encroaching on the head of the humerus, or in the least pushing it from its place; then a piece of pasteboard is to be moulded to the shoulder, and the spica bandage applied and continued in the form of a roller on the arm. The elbow must not be supported; but, on the contrary, by supporting the wrist only, the weight of the arm counteracts the contraction of the muscles.—The arm must not be moved from the side.

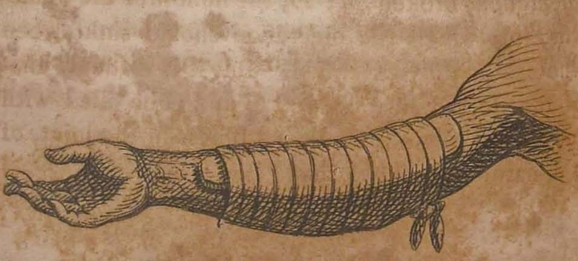
The humerus is sometimes fractured near the elbow, or the inner condyle is broken off, or the bone is split. In these varieties, the knowledge of anatomy will enable the surgeon to put the muscles which are attached to the fragments in relaxation. He will carefully examine the effect of flexion and extension, of pronation, and supination upon the fractured portions, and secure the arm in that position which permits the fragments to repose in their proper places. If the lower end of the humerus be split, a moistened pasteboard splint should be applied on the back part of the elbow joint, adapted to a state of flexion, and two lateral splints will be required to keep the fissure of the bone closed.

OF THE FRACTURE OF THE OLECRANON.

The olecranon may be fractured when a person in running falls, and strikes the elbow on the ground.

No marks are required to distinguish when the prominent process of the ulna at the elbow is broken off. It will, however, be observed, that this makes quite a peculiar case from the circumstance of the strong triceps muscle being inserted into the process of bone which is broken off. The bent, or relaxed position of the limb, which is the position of ease in most fractures, would here have the worst effect, by making the body of the ulna recede from the process which is broken off and attached to the tendon of the triceps.

Let the fore arm be extended; yet not to the utmost stretch. Then the triceps is to be pressed, with a view to relax it, and the olecranon brought down to its place. Dossils of lint are then placed on the sides and above the olecranon; and over these a roller is put on the arm and fore arm. A splint must then be applied on the fore part of the elbow joint with lint beneath it, to fill up the inequality of the joint, so that the fore arm may be prevented from extending fully to the straight line; and, at the same time, prevented from being bent thus.



These

These cautions are to be attended to; because, in the first place, by extending the arm too much, the olecranon, which has been broken off, is pushed from its notch in the lower head of the humerus; and consequently it does not perfectly and correctly unite with the body of the ulna. In the natural state of the joint, the olecranon checks into the hollow of the humerus so as to stop the motion at its due limit, but that check being now done away, the fore arm may be bent back unnaturally, and the ligaments of the joint strained.

In the second place, it must be observed, that if the joint be not enough extended when the bone is set, callus or new bone will be formed betwixt the ulna and the process which has been broken off, so that the olecranon is longer than it ought to be. The motion of extension is thereby impeded, for the olecranon process projecting now too far, will strike into the hollow of the humerus, before the fore arm can be fully extended.

See plan fig. 4. under the head of fractured Patella. A, is the humerus; B, the ulna; C, the olecranon, broken off; D, the hollow of the humerus, into which the olecranon should sink, when the arm is fully extended. But it is evident, that if the dotted line betwixt B and C be filled with new bone, there must be a stiffness in the joint, of the nature of anchylosis.

FRACTURE OF THE RADIUS.

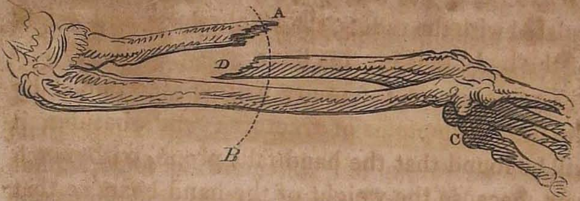
The fracture of the radius may be the consequence of a direct blow on the fore arm; or of a person's

person's falling and endeavouring to save himself, by extending the hand: for the carpus being articulated with the radius, the whole shock and weight of the body falls on this bone.

The nature of the injury will be ascertained by the usual symptoms of fracture: and, besides, it will be found that the hand falls prone, with much pain, because the weight of the hand bears so that the carpal bones and lower head of the radius turn on the small head of the ulna, while the upper part of the radius, not following the lower in its rotation, the broken ends are separated, and the surrounding parts injured.

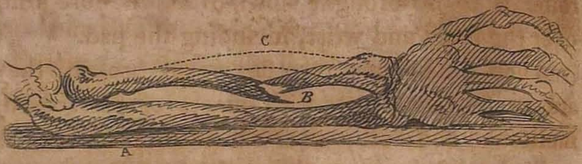
The patient therefore comes to you, holding the palm of the injured arm with his other hand, to prevent the motion either of pronation or supination, but especially the former.

The effect of pronation will be understood by looking to the annexed sketch of the bones of the fore arm. A, is the upper broken part of the radius; D, the lower portion: now by the falling of the palm C, prone, the portion D, turning in the circle A, B, is separated from the upper portion of the bone, and the tearing of the cellular substance, or the bearing of the sharp bone against the parts, is the cause of the pain.



It will be manifest, at the same time, that, if the bone be allowed to remain in this position, a great, irregular callus must be formed betwixt the ends of the bones; and that, when they are thus fixed together, the hand will be no longer capable of supination.

In setting the radius when fractured, we have to apply the splints thus: one along the inside and the other on the outside of the fore arm: the one on the inside should be long enough to reach to the palm, that it may prevent pronation. It is important to observe that if a splint be laid along the ulnar edge of the fore arm, and be made to reach to the palm; or if the arm and hand be laid carelessly in a sling, the following bad consequence results: the ulnar edge of the palm is pressed up, the head of the radius receives that pressure, and the broken ends of the bone are pressed down upon the ulna, as is expressed in this sketch.



A, is a splint, on which the arm and hand rest. Now it is evident that, when the ulnar edge of the hand is thus raised, the radius can no longer keep its natural shape, as indicated by the dotted outline, C; but that, on the contrary, the sharp and broken part of the bone will be pressed near the ulna, as at B.

The consequence of this is, some distortion of the wrist, and an impediment in the rotation of the radius and hand.

FRACTURE OF THE BONES OF THE HAND AND FINGERS.

THE bones of the carpus and metacarpus are seldom broken, without being accompanied by a bursting, or laceration of the integuments. The hand is caught in machinery, or injured by the bursting of fire arms — the fracture of the bones then is the least of the evil. As to the setting of the bones, that is an easy matter: to preserve them in their natural situation, the palm of the hand is laid over a cushion or pad, accurately adapted to the

the hollow of the palm and fingers, and then a roller is to be brought down from the fore arm, over the hand and wrist, including the pad.

When the bones of the fingers are broken, they are to be neatly set, with pieces of pasteboard, moistened and soft; over which a small roller is applied, and to secure the position of the fingers, if several have been shattered, they may be laid over a small cushion, so as to embrace it.

OF THE FRACTURE OF THE THIGH BONE.

It is evident, on the first consideration of the subject, that, in the fracture of the thigh bone, these circumstances must make a peculiar case:

First, The great strength of the bone which implies that there must be great violence and injury done to the limb, at the same time that there is fracture.

Secondly, The magnitude of the thigh, and the great proportion which the injured part bears to the whole body, should lead us to infer that the injury to the system and the effect on the constitution, will be, in a good measure, proportioned to the size of the member which is injured, and the violence it has suffered.

The Third consideration is, perhaps, the most important one—it relates to the great mass of flesh by which the bone is surrounded. For this great mass of muscle being in unceasing action, the lower portion of the bone, on which it operates, is drawn towards the body, so as to make the

the broken extremities of the bone ride over each other; which, in the end, often occasion a short and lame thigh for life.

Lastly, we must take into account the position of the thigh bone: for, as it stands nearly perpendicularly under the weight of the body, and is broken most commonly by a shock perpendicular to the pillar of the bone, it must be liable to be rent and fractured obliquely.

There are very important distinctions to be made in relation to fracture of the thigh bone, from the circumstance of the place and direction of the fracture.

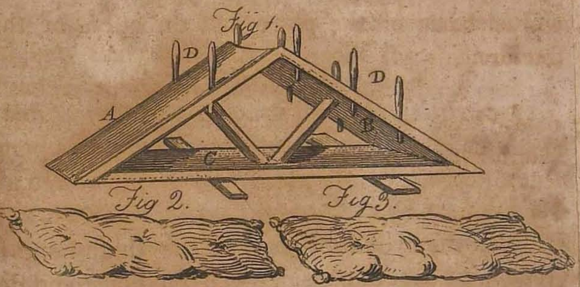
FRACTURE OF THE SHAFT OR CYLINDRICAL PART OF THE BONE.

When the cylindrical part of the thigh bone is broken, we should consider well the place and degree of obliquity of the fracture, before we speak of the event. The higher the bone is fractured, the greater probability is there, that the limb may be shortened during the cure. The reason is that the nearer to the upper end of the bone the fracture is, the greater is the number of muscles inserted into the lower portion, and the greater the retracting force. But if the fracture should be at the lower head of the bone, and also oblique, (as it is apt to be in that case,) then is there danger of the bone uniting with an oblique position of the

 condyles,

condyles, producing distortion and weakness of the knee joint.

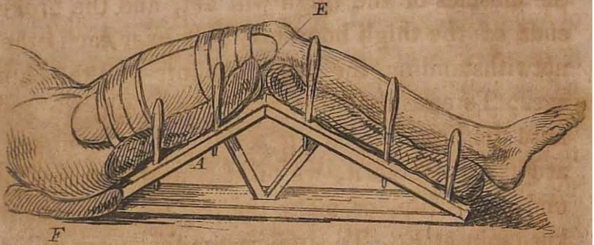
In the treatment of the fractured thigh bone, we have many things recommended, and a variety of apparatus advised, because, in truth, every surgeon has experienced difficulty and disappointment in managing it. What I have now to offer will, I hope, be found simple, and, in proportion to its simplicity, effectual, for securing the limb in the best position.



It will be necessary for the first night to secure the limb with the common splint and bandage and lay it out on a pillow. In an hour this frame may be constructed: two boards, A, B, Fig. 1, of ten or eleven inches in breadth and of a length equal to the distance of the heel from the back of the knee joint, are to be united at an angle answering to an easy and relaxed flexion of the limb, and secured by a horizontal board C. Near the edge of the inclined boards, holes are to be made and pegs of wood fitted to them,

D, D.

D, D. Cushions, like Figs. 2 and 3, are then laid on this frame, when it is ready to receive the limb.



The limb is to be laid over the cushions or mattresses thus supported on their frame. The bone is now to be accurately set, (if it has not been already done,) by the assistant taking the knee, and gently extending it, while the surgeon puts his hand wide over the thigh and the fractured part, that he may feel the crepitation and the motion which the broken extremities of the bone suffer. Now one long splint is to be laid on the outside of the thigh, reaching from the hip to the side of the knee, another upon the inside of the thigh, and over these the eighteen-tailed bandage is to be applied.

It is now to be observed how far the thigh answers to the inclined plane, A; for it will be understood, that the thigh and body, in some degree, now hang upon the angle of union of the

two boards, and that if this board, A, be much longer than the thigh, the muscles of the thigh will be strained. If, on the contrary, it be shorter, the muscles of the thigh will act, and the broken ends of the thigh bone may ride over each other, notwithstanding the lateral splints and the bandage. To ease the muscles of the thigh, we must raise the hip, by placing a thin cushion under it at F: To stretch it, we must take the cloths from under the hip, or make the pad larger under the knee join at E. To support the foot from rolling, the edges of the pillows or mattresses are folded up and fixed by the pegs so as to give a lateral support to the whole limb from the hip to the ankle.

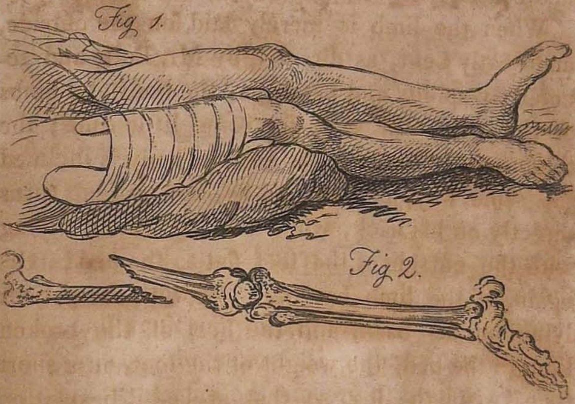
If the thigh has been much bruised, and be now swoln, perhaps it will be better simply to lay it out on this frame without splints, for it will be soft, and be equally supported, and moderately stretched.

What is the most frequent kind of defect in the limb after fracture of the thigh bone? There can be no doubt that it is shortening of the thigh, together with a twist of the limb, which lames the patient by depriving him of the strength from the muscles of the leg, and takes at the same time the length of the foot from the step of that leg. We have now only to consider the latter of these effects of inattention; having, as we hope, done all that can be done, by the substitution of a simple contrivance, and by making the weight of the body the counterpoise to the strength of the muscles,

muscles, to prevent the retraction of the limb, and consequently the permanent shortening of it.

When the limb is merely laid on the outside, and gently bent, as directed by Mr. Pott, and secured by splints and bandages, the body and limbs of the patient lie well, for some little time; the thigh rests on its outside, and the body is inclined the same way, but, by and by, the patient turns directly on his back, while the leg remains lying with the outside of the foot flat to the bed! Or, again, if the limb has been set with the patient lying on his back, and the heel of the broken limb to the bed, the weight of the foot, in a short time twists the leg, so that at last it lies flat on the fibula, while the patient continues on his back. This could not take place was the thigh bone entire; but now the lower piece of the thigh rolls outwardly, while the upper part remains in its place. The bones thus twisted, unite, and, when the patient rises from bed, we find that he points the toe too much out in walking, that he carries the side of his foot forward, and has consequently lost the use of the elastic arch of the foot.

This sketch will illustrate my meaning.



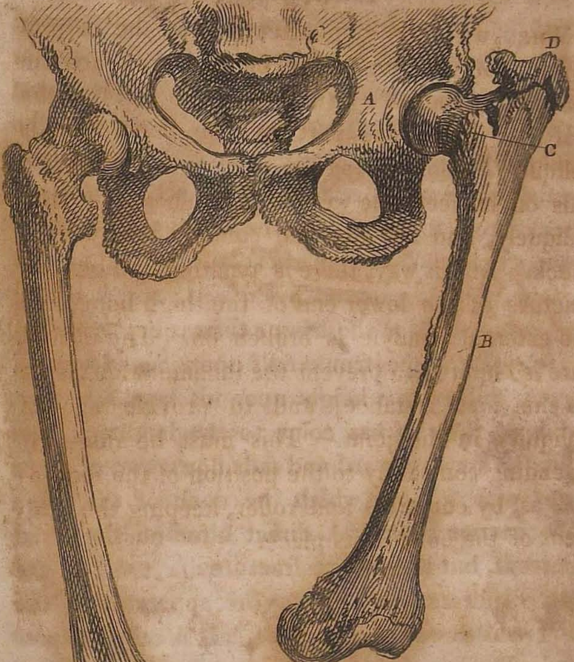
In Fig. 1, I have given a sketch of the limb, as I have seen it lying — the knee bent, the side of the foot flat on the bed, the leg shorter, (though this is not easily ascertained, from the different aspects of the limbs,) while the patient lies flat on his back.

Fig. 2. shows what has taken place — that the broken ends of the bone have shot past each other, by the retraction of the muscles, while the lower part of it is twisted outward, by the falling of the foot on the outer ancle, there being no impediment to this motion from the trochanters and the hip joint as when the thigh bone is intire.

FRACTURE OF THE EXTERNAL CONDYLE OF THE THIGH BONE.

When we turn our attention to the natural position of the thigh bone, or when we place the condyles of the bone on the table, we find that the shaft, or cylindrical part of the bone, stands obliquely. So it happens that, in a person who falls on his feet, the weight of the body operates obliquely, and the external condyle receives the shock. In this way, there is sometimes an oblique fracture of the lower end of the thigh bone, and the external condyle is broken off. The utmost care is required to prevent the inflammation rising in the first instance, and to provide against obliquity in the joint. This must be done by attending constantly to the position of the foot, as well as, by compress and roller, keeping the fragment of the bone in its place.

OF FRACTURE OF THE NECK OF THE THIGH BONE.



Explanation of the Plate.

This is a sketch of the bones of the person mentioned in the text. The right thigh bone is natural, the left one much shortened by the fracture of the neck. A, the os Innominatum; B, the shaft of the thigh bone; C, the neck of the bone fractured; D, the trochanter major broken off. The comparative elevation of this point above the level of the head of the bone, will mark the reason of the shortening of the limb. The pieces of bone were united by a ligamentous substance, not by bone.

WHEN

When we hold the thigh bone before us, and consider the position of the great shaft of the bone, and the obliquity of the neck, standing off at an angle to the shaft or pillar of the bone; when we consider the strength of the shaft, or cylindrical part of the bone, that it stands almost directly under the weight of the body, and that the neck of the bone, on the contrary, is smaller and weaker, as well as oblique, — we see why, in all shocks from the descent of the body upon the thigh bone, the neck is the most apt to be broken across.

The neck of the thigh bone then is broken when the weight of the trunk falls upon it; as when a person falls from a height upon his legs, or when thinking that he has come to the landing of a stair, he steps forward and falls down two or three steps, with a shock which the neck of the thigh bone cannot bear. A direct blow on the joint injures it, but there is no fracture: a twist of the limb dislocates or injures the apparatus of the joint, but there is no fracture. It is only the perpendicular impulse that can fracture the neck of the thigh bone.*

I have dissected the joint some months after the fracture of the neck of the thigh bone, and have found the bones still loose. There was at least

* Although at this time, when I am correcting the sheet, I am made sensible that a man may fall on the trochanter, and break the neck of the thigh bone; yet I am convinced it is so little likely to happen, that I venture to keep the text as it stands.

only

only a very imperfect union betwixt them, by a strong and irregular ligamentous matter. I mention this not as a curiosity, but in confirmation of a general opinion, that the neck of the thigh bone will not unite, or not readily, in the usual way by bone. Since the first edition of this book I have seen a patient with a fracture of the neck of the thigh bone perfectly cured, without shortening or obliquity of the leg. But on the other hand, I have dissected the joint after fracture of the neck of the thigh bone, where the bones were not reunited, and where by the friction, as I suppose, the surfaces were excited to absorption, and the neck of the bone destroyed. These specimens will be found in my Collection.

It is of importance to notice the motion of the hip joint on almost every occasion; in the natural state of the parts, indeed, we are not aware of every motion to which it is liable; but when the sensibility of the joint is increased by disease or injury, we discover, that scarcely a muscle of the limb moves without moving the thigh bone in the acetabulum: and that the patient does not move his trunk even in the slightest degree, but the pain is excited by the motion of the joint.

This perpetual motion of the head of the thigh bone, is a principal cause why, being broken, it does not unite.

Certainly too, there is something unfavourable in the circumstance of the neck of the thigh bone being surrounded by the secreting and lubricating capsule of the joint, not by the cellular membrane, and vascular muscles, which embrace the broken ends of

of the bone in other fractures. The broken head and neck of the thigh bone, must be deprived of that due degree of inflammatory action of the surrounding parts which is necessary to sustain and consolidate it. But having seen the fracture of the neck of the bone, with a breaking up of the whole trochanter major, and part of the shaft of the bone, while yet there was no union by callus; I cannot attribute the defect of ossification entirely to this circumstance, viz. the difference in the nature of the surrounding substance.*

The great strength of the muscles surrounding the joint, sufficiently explain that most untoward circumstance, the shortening of the limb, in fracture of the neck of the bone. The whole strength of the muscles of the hip, of the psous muscle, and of the muscles of the thigh, is operating incessantly in the retraction of the cylindrical part of the bone. To counteract this dragging of the muscles, I know nothing more effectual than laying the limb on the frame which I have already described; I do not imagine that any splints about the thigh or joint, or any kind of bandaging, will be so effectual to retain the limb in its natural position, although I would not neglect these.

It is particularly necessary to point out the distinctions betwixt this fracture and the dislocation of the head of the thigh bone.

1. In the first place the surgeon has to attend to the crepitation, and for this purpose he puts his

* The head of the bone has been found sunk betwixt the broken portions of the trochanters.

hand

hand on the joint, while the limb is moved. But it must be recollected, that the effect of mere inflammation in the joint, is to change the secretion of the sinovia so much, that the cartilages move with less facility, and produce a jarring sensation, which may be mistaken for crepitation.

2. We next attend to the ease with which the limb is stretched. By a majority of consultants, I was induced, contrary to my own opinion, to put the apparatus on an old woman, and to endeavour to reduce what was supposed a dislocated hip; but placing my hand on the trochanter major, and pressing a finger of the same hand on the prominence of the ilium, I knew decidedly at the first motion of the assistants in pulling the limb, that it was a fracture, from the ease with which the trochanter moved, and from the increase of the space betwixt the ilium and the trochanter.

3. In dislocation, the limb is locked as it were; but in fracture, it is easily moved, in as far as regards the surgeon's exertions, though with pain to the patient. And when the limb is moved in fracture, it is with a certain degree of elastic resistance; but in dislocation it yields by starts, and unequally.

4. When we make an assistant take hold of the knee and ankle, and bending the knee joint make the rotatory motion of the thigh bone by using the leg as a lever, we may observe the following distinctions betwixt fracture and dislocation. When the heel is moved out, the head of the thigh bone checks against the back of the ilium in dislocation; whereas in fracture it has no such impediment. Again, when

when we make the assistant roll the thigh, while we keep the fingers on the trochanter major, we feel it, in dislocation, making a movement describing a part of a large circle; but in fracture, it moves on the centre of the cylindrical part of the thigh bone, to which it is nearly parallel, and consequently in its motion it does not escape from under the finger.

See further under the head of Dislocation of the Thigh Bone.

As I have said, I conceive that the frame which I have recommended, in the fractured thigh bone, will do all that is possible to perform in the present case; it will retain the thigh bone, and the great trochanter, in their natural place and relation to the neck of the bone. But lest my reader should object to this, and think that it is better to assist the operation of this frame work by bandaging and splints, or would rather trust to the general experience of the profession, he may take the following method:—

You extend the limb until by marking the relation of the trochanter major to the ilium, you find you have brought the bones into their due relation to each other. You then lay compresses above and on the sides of the trochanter; then a roller is put round the pelvis and thigh, so as to keep these compresses and the bone firm. (So far it may be well to do before laying the limb out on the inclined planes—I object to what follows, in the common treatment, as inefficient.) A long splint of wood is put along the whole thigh, fixed at the upper part by having the end

end pushed into the folds of a bandage or belt, which goes round the pelvis; while to the lower part are attached bandages, which go round the knee and ankle, and which may be drawn so as to stretch the limb.

OF THE FRACTURED PATELLA.

The fracture of the patella, or knee pan, happens in consequence of a sudden and very strong action of the four muscles which are inserted into it, while the knee is in that degree of flexion that raises the patella upon the convex surface of the lower head of the femur. Sometimes the patient observes that the crack of the fractured bone was before he fell to the ground; while, for the most part, deceived in the circumstances, he supposes that in striking the ground, the knee pan has been fractured. It must, at the first view, appear strange, that the patella can be broken by the mere force of the muscles! but two things are to be considered, the great massiness and strength of the muscles which operate on it, and the position of the patella.

The muscles which operate on the patella, are the *rectus*, the *vastus externus* and *internus*, and the *cruræus*. These, which may be called a quadriceps muscle, raise the whole weight of the body, and are powerful in their ordinary action. But when a man slips his foot, and I may say the whole muscular frame is brought into sudden and violent action, the power of those muscles is very great. Again, the patella cannot be broken when the

 muscles

muscles pull directly in the line of the bone; that is, when the limb is straight; nor yet when the knee is so bent that the patella lodges betwixt the bones, and is supported by the condyles. But when the knee is moderately bent, and the patella is raised on the convexity of the lower head of the thigh bone, the muscles act at an angle with the ligament of the patella, and then the patella is broken across. The patient falls to the ground, and the surgeon finds that instead of the usual prominence of the knee, the joint is flat, and he feels the greater portion of the patella drawn upward on the thigh, while the other part is still attached to the ligament, and the two condyles of the thigh bone, are prominent. See plan, fig. 3.

Treatment.—Let the surgeon avoid all motion in the limb, or at least bending of the knee joint, else there will be further danger of laceration. If the patient is to be carried home, in order to be quite safe, he has only to be carried sitting upright in a chair, with his leg extended. There is no occasion for a bandage to secure the upper portion of the patella, from being drawn further up on the thigh.

When the patient is laid in bed, we have to bring the fractured portions together: first, by position, secondly, by bandage. It will be manifest, that the leg is to be laid (in opposition to the general rule) extended; so that the lower portion of the patella may be raised on the fore part of the joint. The trunk of the body must be brought forward in the sitting posture, that the point of origin of the

rectus from the pelvis, may incline towards th knee, and relax the quadriceps muscle. Or instead of the patient sitting continually in an uneasy posture, he may lie on the side, only taking care to have the thigh brought up towards the body and the leg extended.

When the extensor muscles of the leg, which are inserted into the patella, are thus to the utmost degree relaxed, the pieces of the patella will have come into their natural position. A roller should now be put round the thigh, and a bandage must be applied to guard the bones against the accident of an unwary movement, drawing them asunder.

A long double neckcloth is twisted together, and held with both hands, then laid over the knee above the upper portion of the patella; it hangs down on either side; take hold of the hanging parts of the cloth, and with the fore finger of the left hand hook that which is held by the right, and with the fore finger of the right hand hook the cloth where it is held by the left, so as to bring them across under the knee: then bring the ends of the cloth over the lower part of the joint, and below the inferior portion of the patella, and pass them through their respective nooses, formed as described by the fore fingers; draw the whole tight, and then approximate the two circular turns of the bandage, which are now formed above and below the knee pan, by finally passing the ends through the upper circular, and fixing them there.

For the same purpose, that is to bring the fractured portions of the patella together, there is an

 apparatus

apparatus of leather with pads, to pass above and below the fragment of the bone, and to draw them together, but it is not in use; most surgeons trusting to position alone for the reunion of the patella. By position, by the use of the roller and bandage, I believe it to be possible to make a cure by union of bone; but the specimens of the new ligament in my collection will prove how difficult the attempt is, how often it fails.

We have now to inquire why there is so remarkable a lameness after the fracture of the patella, and why the patella of the other side is so apt to be fractured in a person who has once met with the accident.

The second accident follows naturally from the lameness consequent on the first; and this lameness, which is so frequent a consequence of the fractured patella, proceeds from two circumstances. 1. The fractured pieces are not brought into accurate correspondence; but owing to the imperfect relaxation of the quadriceps muscle, the upper portion is kept too high to be in contact with the lower, and instead of bone uniting the two parts of the patella, there is a long intermediate ligament (such as I have represented in the annexed plate). One consequence of this is, that the muscles being allowed to remain contracted, they lose their power of giving a perpetual tension and support to the limb, and also of accommodating themselves readily, and with sufficient strength to the necessary motions. 2. The patella, in its natural position on the top of the knee, being somewhat removed from the centre of the

the joint, bestows a power on the muscles, by extending the leaver on which they act; but when, instead of the bone, the new-formed tendon runs over the articulating head of the thigh bone, this lever-power is lost.

If unfortunately the patella should be united by a long intervening ligament, we need not despair of bringing the muscles to accommodate themselves to this lengthening of their tendon. Often, though the thigh bone be remarkably shortened after fracture, yet the muscular action of the limb is by exercise restored to full power. So in this instance, by exercise, the shortened muscles become capable of still further contraction. To facilitate this, Mr. Hunter recommended that the patient should seat himself on a table, and by giving motion to the leg, exercise these muscles; and that he ought to put a weight on the foot, to be increased as the power of the limb was regained.

When the patella is fractured by a blow, as I have seen it by the kick of a horse, the connexions of the muscles with the joint, independent of the patella, keep it from being drawn up, as in the fracture I have already described. Here the injury to the joint is so great, that we cannot apply a bandage if it were required. We trust to the position alone, and are careful to bleed largely, and apply cold cloths so as to keep off inflammation.

I have seen a very terrible accident follow the imperfect cure of the fractured patella. The bone had united by ligament, and this ligament had incorporated

porated with the skin in such a manner that it lost much of its pliancy. The poor man was carrying a burden and fell backward, the knee sunk under him, and the whole fore part of the joint was laid open by laceration. The case terminated in amputation of the limb.

RUPTURE OF THE LIGAMENT OF THE PATELLA.

The rupture of the ligament which is on the fore part of the knee, and which passes from the patella to the tuberosity of the tibia, has so many points of resemblance with the last accident, that no one will wonder why I should speak of it here.

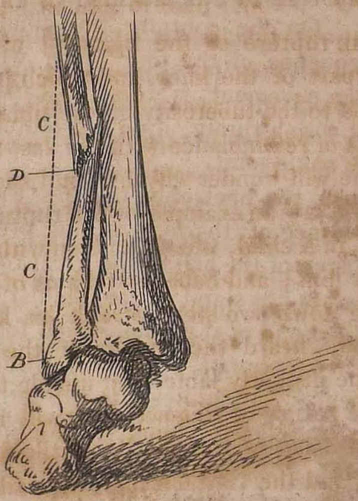
Petit saw an example of the rupture of this ligament, in a child, who had fallen with the knee bent under him; and Sabatier tells us of a person who, falling down two steps, struck his knee upon the ground, heard the crack of the rupture, and became instantly lame, and unable to rise.

The nature of this accident will be ascertained by the rising of the patella to the fore part of the thigh, and the void left above the tibia, and on the fore part of the knee joint. The patella is, besides, quite moveable, being no longer held by the attachment to the tibia and the tension of the muscles.

The union of the ruptured ligament is to be procured by simply bringing them into contact: 1. By the position of relaxation. 2. By bandaging the quadriceps muscle. 3. By drawing down the patella

patella to its proper place upon the top of the knee.

A partial rupture of the tendon of the quadriceps muscle may also occur, and it is to be treated nearly in the same way, that is, by placing the patient in the position of perfect relaxation, and by bandaging the thigh.



FRACTURE OF THE FIBULA.

In this sketch, we may discover the nature of the case of fractured fibula. In the first place, it brings to our recollection that the fibula does not support the weight of the body, and that it will never be broken by the shock of the body on the leg, unless the tibia first gives way. But remembering the constitution of the ankle joint, and that the

the fibula reaches down upon the outside of that joint, it is pretty evident that the fibula can be broken only by a force directly applied to it, or by a twist of the foot. The first example, is when a man falls, and the side of the fibula strikes a stone, over which it is broken; or when he receives a blow on it, or when his leg is pressed betwixt his horse's side and the ground: this is the simplest case. On the contrary, the fibula fractured in consequence of the foot being wrenched on an uneven pavement, is worse, because it is complicated with a sprain, if not absolutely a dislocation of the ankle joint.

When the heel only touches the ground, and the balance of the foot is not preserved by the resistance of the ball of the great-toe, (as the heel bone does not stand perpendicularly under the tibia,) the end of the tibia, which forms the *malleolus internus*, bursts, or at least strains the deltoid ligament, which unites it to the astragulus. Then the point of the fibula, B, forming the *malleolus externus*, preserves the joint intire; or if the violence be very great, the bone falls on this small bone in the direction of the dotted line, C, C; so that it yields and breaks a little above the ankle, as at D. It follows from this, that when we find a patient complaining of a strain of the inner ankle, we examine the fibula, &c. if in any other instance we see plainly that the fibula is broken, we are careful to examine the inner ankle, knowing that it must have suffered in some degree, though there may not be a subluxation.

 A splint,

A splint, which will reach from the knee along the outside of the foot, is prepared. In the hollow of the splint, soft lint is placed, so that it equally supports the limb, an eighteen-tailed bandage is put under the splint; and this apparatus is so placed on the mattress, that the patient's leg, being laid upon it, rests on the outside of the leg and foot. Having laid down the leg on the splint, we examine again the degree of prominence of the inner ankle, and see that there is no twist or obliquity of the foot. We are careful to notice, that the lower head of the fibula, and the side of the foot, are equally supported; that the side of the foot is neither allowed to hang over the end of the splint, nor too much pressed up; the bandage is then applied. From time to time we must examine, lest the integuments of the inner ankle indicate too great a degree of prominence in the tibia; and also, to see that the heads of the fibula, on which the limb now lies, are not suffering by the pressure.

OF THE FRACTURE OF THE TIBIA.

There is no difficulty in ascertaining the nature of the case, when the tibia is fractured.

The splints to be applied are, first, one strong splint of wood and leather, or of tin, which is to reach from the outside of the knee to the side of the foot. It must be made to receive the upper and lower heads of the fibula, and hollowed to receive

ceive the prominent muscles of the outside of the leg. Another splint, shorter than the last, is to be adapted to the plane surface of the tibia, on the inside. This splint should be straight, and reach only to the heads of the tibia.

The fracture of the tibia is often of the worst kind. The tibia is weak, when we consider that the bone of one leg only often sustains the whole weight and shock of the body.

Like the thigh bone, it is often broken obliquely, because it receives the shock of the body perpendicularly on its shaft; but a worse circumstance in the state of this bone is, that it is covered only by the thin integuments. These together, are the causes of the compound fracture of the tibia being so very frequent. They explain also how a compound fracture of any of the other bones, which are deeply imbedded in the soft parts, can be with more ease converted into a simple fracture; their broken extremities can be withdrawn from the wound, and the integuments healed, but in the tibia this is not always practicable.

In the treatment of the fracture of the bones of the leg, there is only one thing more to be noticed in the way of a leading principle. I allude to the strength of the muscles of the leg, (muscles sufficiently strong to raise the weight of the whole body,) being on the back part only; the consequence of this is, that immediately on the accident, they are apt to cause the two pieces of bone to stand at such an angle as to thrust the broken ends through the integuments.

When,

When, during the cure, the broken ends of the tibia are seen to project more and more at the shin, it is to be attributed to the action of these muscles: and I conceive the best way of counteracting this, is to turn the limb, so that the heel may rest on the bed, while the toes are extended. This relaxes the muscles, while it gives the weight of the limb to counteract the curvature which is taking place. If the foot rests so that the toes are perpendicular to the heel, then there is a stress upon the muscles of the legs, because the Achillis tendon is stretched, and I have often seen the os calcis suffer so that it has become carious.

When the heel is made to rest on the bed, care must be taken that the foot do not fall outward, else the tibia will be twisted, and there will be an irregular prominence of the broken bone, on the inside of the shin.

OF THE PERIOD OF CONFINEMENT IN FRACTURE OF THE EXTREMITIES.

The last observation I shall make, regarding fracture of the limbs, relates to the length of time which is necessary to the complete union of the bones. Different periods are prescribed to us before it shall be permitted that the patient should rise and use his limbs. Yet as far as I have been able to judge, the period of confinement ought not to be determined, on the idea that there is any distinction in the commencement or termination of the process of ossification in the smaller and in the larger

larger bone. The arm bone will unite as soon as the clavicle; and if the derangement of the surrounding parts, in the case of fractured thigh bone, be not much greater than in the fractured arm bone, the greater bone will be united as soon as the lesser. But in giving liberty to the patient, we should have regard to the use of the limb, and the stress to which the bone is to be exposed. And then, indeed, a proper difference arises between the bones of the arm, and those of the lower extremity; in the former, the bone bearing the weight of the limb only; in the latter, the bone sustaining the weight of the whole body and limb.

The bandage around the fractured clavicle, may be eased before the expiration of the month; but the arm ought not to be moved till the end of the month.

Indeed the fractured humerus is not secure before the end of six weeks; and the same time is required for the bones of the fore arm.

But we cannot allow the patient who has had a broken thigh bone, to rise till after the six weeks; and then he is not to risk the weight of the body on the limb, but the limb is to be lifted and placed free upon the bed; so in fracture of the tibia, the confinement, or at least the precaution against resting on the limb, must be continued as long as in the instance of fractured thigh bone.

A difference may be observed in the time of the knitting of the fractured bones, ascribable to the

state

state of the patient's health, and of course this will depend on air, diet, and constitution.

When there is pain in the attempt to use the limb, it indicates, that the inflammation has not subsided, or that the natural action is not yet established. It ought, therefore, to make us cautious of using the limb.

OF FRACTURES OF THE RIBS, STERNUM, AND PELVIS.

The cases of fractured ribs, sternum, or pelvis form a distinct class, because they resemble injuries of the skull more than the fracture of the bones of the extremity, in this, that they are dangerous only in so far as they do mischief to the contained viscera.

OF A FRACTURED RIB.

The principal security of the bones of the chest is their elasticity. While the perfect elasticity of the cartilaginous joinings of the ribs remains, they are much protected, because they yield, and by that means are saved from shocks which would break them; therefore, men of mature years are more liable to have fractured ribs.

The ribs are often fractured by the person falling on a projecting corner, as of a table or chair. If he be reaching to take down something above him, and, stepping on a chair, he falls and strikes his side upon the corner of the chair, he will probably break his ribs. But I have had strong grounds

grounds of suspicion that patients have been braced up for weeks without any necessity, and that both surgeon and patient have mistaken the pain of the bruised muscles, which lie on the side of the chest, for the effect of fractured bone.

To find whether the rib be broken or not, we must feel along its whole course; but if there be a particular spot very painful, and yet we do not distinguish the fracture, we must press in the rib at a part remote from this; when, if it be fractured, it will yield, and produce the same pain as before; but if the bone be entire, there will be no pain, because the bruised integuments are not affected by the pressure. When the patient insists that there is something particularly wrong, because he finds a sharp pain when he moves, it should still be considered whether this be not owing to the bruised flesh of the *descendens abdominis* or *serratus magnus*. You make him breathe, and there is no pain nor crepitation while you place the fingers on the part; you make him exert those muscles while the breathing is suspended, and then he feels the sharp pain caused by the action of the bruised muscles.

When a rib is broken, we have only to keep it from moving by preventing the motion of the chest in respiration; for it is unnecessary to attempt to keep the rib in its place, this being already accomplished by the neighbouring ribs, and by the connexion of the rib with the intercostal muscles. It is to be remarked, that the lower ribs have so free a motion, and so much elasticity, that they are not apt

apt to be broken; while the upper one is defended by the clavicle.

If a fractured rib be neglected, there is much pain, and much danger of inflammation in the chest, and, in the end, of caries of the rib; for, by the motion of respiration, there is an incessant rubbing and grating of the broken ends of the ribs which prevents their union.

I have dissected the body of a man who died in consequence of the fracture of two ribs; or rather, I ought to say, in consequence of their being neglected, the nature of the case having been misunderstood. There was an abscess under the pectoral muscle, and a caries of the ribs; and, from the irritation spreading within the chest, much matter had been formed in the cavity, and even the pericardium contained pus. It will be said, that this extensive mischief could not have proceeded from the fracture of two ribs, had not the constitution been bad. This may be true, but from this we can only infer, that we should be more careful of such accidents where there is constitutional weakness.

The mention of this terrible consequence of neglected fracture, reminds me of the necessity of cautioning my reader against the consequence of a mere BRUISE OF THE CHEST. For, if abscess form under the broad muscles of the side, caries of the bones and abscess within, may be the consequence. It becomes our duty, therefore, to take precautions that matter do not collect under the pectoralis major or serratus muscles, and still more, that

 disease

disease of the sternum does not follow contusion of that bone.

A compound fracture of the ribs will not readily happen in consequence of the ribs projecting, for the ribs are, in truth, beaten in when fractured. But, owing to this latter circumstance, the fracture of the rib is often complicated with a puncture of the lungs, or the rupture of the intercostal artery.

When one or more of the ribs are fractured, a broad roller is put abcut the chest, and a split cloth is laid over the shoulders, to the ends of which the roller is pinned. This bandaging forces the patient to breathe by the diaphragm and muscles of the belly, while the chest is relieved from motion. The patient is then bled and put to bed. Bleeding, in this case, not only prevents the membranes of the chest from inflaming, but, by diminishing the quantity of circulating blood, it relieves the respiration, because the extent and frequency of the distention of the lungs is proportioned to the quantity and velocity of the circulating blood. If there be a tickling cough, after the bleeding, opiates with mucilaginous mixture may be given.

If, after the patient is put to bed, there ſhould come on a difficulty of breathing, with oppression in the cheſt, the end of the rib has probably pierced the pleura and penetrated the lungs, and the cavity of the cheſt probably contains air which has escaped from the lungs. If a tumour on the broken rib succeeds to this, which crackles under the finger, it is the emphysematous tumour, so peculiarly

liarly characteristic of this accident. The air has been forced from the cavity of the chest into the cellular membrane by the compression of the chest, and it may be forced from the cellular membrane, which covers the wounded rib, over the whole body, even until it closes the eye-lids and distends the scrotum and integuments of the penis.

When the tumour merely betrays its nature, without much inconvenience, although we watch it, we do nothing: but if it increases rapidly, and is attended with much oppression, punctures must be made in it with the lancet and the air pressed out, that both the cellular membrane may be freed from air, and the breathing from great oppression.

While, in consequence of the accidental puncture of the lungs by the rib, the air distends the cavity and compresses the lungs on one side, the breathing and circulation may be oppressed and difficult; but still there is no interruption of the function of respiration: at last, however, by the great distention of one side, the mediastinum suffers, and the cavity of the other side is encroached upon; and both the diaphragm and the external muscles of respiration are impeded in their action. There is a sympathy which prevades all the muscles of respiration, and even if the cavity of one side be distended, the muscles of that side cannot act, and their impeded action prevents the free motion of those of the other side. Therefore it is that in emphysema there is, in the end, great anxiety and oppression, and the heart

 par-

partaking of the influence, there is a feeble pulse and cold extremities.

When the emphysema has proved the nature of the case, and the symptoms are thus pressing, we have to make an incision through the integuments and intercostal muscle, and then puncture the pleura; by this means the lungs of the wounded side will be in a great measure free, and the play of the chest will become free, and the lungs of the other side will resume their full action.

When a rib is fractured, the intercostal artery may be torn; and should it happen that the artery is opened, and yet not torn across, it will bleed until the lungs are oppressed. Then, with the common marks of hæmorrhagy, the patient finds himself greatly oppressed. He has a sense of suffocation, and cannot lie down; and he breathes with contortion of the body, to allow the side of the chest opposite to that which contains the accumulated blood, to expand in inspiration. It is, in this case, the business of the surgeon to make an incision on the lower edge of the rib fractured, and a little further back than the broken point of the rib, taking care not to cut the artery which lies just under the rib; and, having cut through the integuments and intercostal muscles, he ought to puncture the pleura. If he finds coagulated blood, he will be tempted to enlarge the wound, and introduce his finger to give vent to the blood and coagulum. If, after this, the blood accumulate again, it must be again evacuated, and the artery

compressed

compressed against the rib. Should there be bloody froth discharged from the mouth, the lungs are wounded, and the greater danger of the case is declared.

FRACTURE OF THE STERNUM.

The fracture of the ſternum is a very alarming accident, both from the parts contained under it and from the spongy nature of the bone. Like the ribs, during respiration, the sternum is in incessant motion; and the thorax being of a conical form, and the lower part admitting of a much greater extent of motion than the upper part, it follows, that when the sternum is fractured across, there is a perpetual grating of the broken parts of the bone; the lower part of the sternum, being attached to the longer ribs, moves through a larger space than the upper portion. This rubbing and grating of the fractured bones will produce inflammation and suppuration under the bone, viz. in the interior mediastinum.

The danger from the mere motion of ordinary respiration is, of course, much increased when the almost inevitable consequences of the accident supervene—irritation and inflammation in the chest, and a troublesome cough.

From these considerations it will be understood how the patient, having happily escaped the immediate shock and injury to the thoracic viscera, is in danger of having caries of the bone, and abscess under it; and it will be seen too, that the swath-

ing, or bandaging of the chest is equally necessary here as in the fracture of the ribs, and that bleeding must be oftener repeated, and every possible cause of irritation avoided.

It may happen that we require to draw out and pick away broken pieces of the sternum; but fracture of the sternum, I am inclined to hope, does not ever require the trephine. We have however observed that the sternum is a very spongy bone, and therefore a part that is not always secure from scrophulous action when it is bruised. The caries of the sternum does, in some measure, hold analogy with the caries of the skull: it is the communication of the disease to the contained parts which we have to dread in both: and here it may be necessary, in some cases, to apply the trephine to allow the free discharge of matter, or to take away a dead piece of bone which is the source of irritation.

FRACTURE OF THE BONES OF THE PELVIS.

The most common fracture of the pelvis is that of the ala ilii. Thus a person falling from a heighth breaks off the corner of the haunch bone. The principal object of the surgeon in this case will be, to confine the patient to that posture which permits the broken part to remain in contact with the body of the os ilii. This he contrives by considering the action of the abdominal muscles in pulling away the fractured portion, and perhaps also the action of the sartorius, and by placing the patient in a position to relax these muscles.

When

When the whole arch of the pelvis is broken through, the shock of the body must have been great; the danger is therefore imminent. Even independent of the original violence, the accident is pregnant with danger; for although while the arch of the pelvis is intire, we do not perceive how much it bears of every motion of the body; yet, whenever this arch is broken, the motions of the trunk, even the motions of the limbs, make the broken surfaces jar and move upon each other, so that inflammation and suppuration comes on within the pelvis. Such is the situation of these bones at the same time, that we can do little more than swathe the lower part of the body, or put a broad bandage round the hips and pelvis, so as in some measure to support the bones and keep them together, taking care at the same time to ward off inflammation by all the usual means.

FRACTURE OF THE BONES OF THE FACE.

The lower jaw bone, being much exposed and moveable, is very often fractured. It is fractured by blows and falls, and it is often found to be broken in two places. The reason of this complicated fracture we may see in the arched form of the bone and the support it has at the condyles; for it is impossible that one side of the bone should be beat in, without some other part of the arch suffering, at the same time, in nearly an equal degree with the part which is struck.

I cannot conceive how a difficulty can arise in ascertaining the nature of the case when the jaw bone

bone is fractured; yet I have had occasion to set it after an eminent surgeon had dressed all the other hurts, but taken no notice of this—and authors insist on the marks of fracture as of the first importance. To examine the jaw bone, we place the fingers of the left hand on the angles of the bone, and then take hold of the alveolar part of the jaw bone in front, and endeavour to move it laterally. We in the mean-while keep the eye on the teeth, when we shall easily discover whether there has been any fracture of the lateral part of the bone: or we feel and press along the base of the jaw. In boys there is sometimes a splitting of the lower jaw at the symphysis, which is not so readily ascertained. The patient has perhaps fallen from a height; he has lost one or two of the front teeth, or they are loose, and a greater space than natural is betwixt them: By taking hold of the alveolar part of the jaw, with the finger and thumb on each side the symphisis, the fracture is at once ascertained by the usual symptoms.

If a boy has split the symphisis of the lower jaw, we replace the teeth, and then bring the sides of the jaw together. We then take a bandage with four tails, and cut a hole in the centre of it, which will just admit the chin. The centre of the bandage being placed over the chin, the two upper tails are brought round the back of the head, and the two lower tails are carried over the vertex. I have found this quite sufficient to keep the jaw bone and teeth in accurate contact. The bandage may be made more secure by covering that part of it

which

which embraces the face with an adhesive plaster. If it be thought necessary to tie the teeth together, the whole of the front teeth ought to be included in a cord of silk; but this cannot be done, if the teeth have been shaken and are loose.

In the case of fracture of the base of the jaw, and especially if there be a fracture of both sides, it is more difficult to keep the pieces in their place. This is owing to the same circumstance that disorders all other fractured bones, viz. the unequal action of the muscles. We may recollect that the muscles which close the lower jaw are powerful, and are fixed into the coronoid process, or the angle of the jaw. The muscles which draw down the jaw are weak, but inserted into the bone more forward, so that they operate with a longer lever. These different insertions of the two classes of muscles cause a distortion of the jaw bone, when it is broken as we have described; for then the back part of the bone is held firmly up, while the fore part is pulled down by the muscles of the throat and the digastricus.

If the teeth be very regular, and those of the upper and lower jaw correspond, those of the upper jaw serve the purpose of secure splints, when the base of the jaw and chin are bandaged. If the patient has lost a tooth previously, and when the pieces of the broken jaw are brought together, there is a deficiency or inequality in the teeth, then a piece of cork may be adapted to the teeth of each side in such a manner as to serve the purpose of a splint. The chin being brought up, and the hind-

most

most pieces of the bone pushed back so that there is an adjustment, the jaw is to be secured on the outside. A piece of pasteboard is to be cut into such a shape as may be accommodated to the chin and jaw: it is to be notched round the edge, and then moistened, that being applied on the lower part of the chin it may be brought up on the base and sides of the jaw on both sides. Over it is to be applied the four-headed roller as already described.

There can be no occasion, in this case, for feeding the patient with a pipe, or attempting to nourish him with clysters. Perhaps he may fortunately on this occasion have lost one of his teeth, and through the interstice he can suck his nourishment.

But if the teeth be quite perfect, in that case, rather than that he should have to live altogether on liquids, the cork splints may be laid along the teeth, which, while they give support to the bandaging, will allow an interstice in front for taking food.

There is a fracture of the root of the condyle sometimes, which is not so easily distinguished as the fracture of the base of the bone. Yet when we press the finger before the ear so as to feel the condyle, and at the same time move the jaw, we shall discover that the condyle does not move with the body of the jaw bone, and that there is crepitation.

In the treatment, it will be necessary to attend to the swelling of the salivary glands, which sometimes give great distress.

FRACTURE OF THE BONES OF THE NOSE.

No doubt the ossa nasi suffer fracture, but they are oftener in a manner dislocated, that is to say, one of them is beat in, while the other lies over it. When they are fractured and entirely beat down, the shock sometimes reaches the septum nasi, and it is also fractured; nay, a worse effect may yet be a consequence of a blow on the nose. It has happened that the delicate cribriform plate of the ethmoid bone has been fractured and pushed up on the brain, from the shock communicated to it through the septum!

The arch of the nose is to be raised by a strong probe covered with lint: by putting oil on the little finger, we may push it into the nostril, so as to replace the cartilage and bone of the septum; tubes of any kind, I believe, cannot be introduced so as to support the broken bones. When the bones are replaced they will not readily move from their place; there are no muscles, no motion of the part to change their position, and very soon a swelling of the nose and membranes comes on which supports them sufficiently.

If, in consequence of a blow on the nose, and a fracture of the ethmoid bone, there should succeed discharge of matter with symptoms of a beginning affection of the brain, then ought we to probe gently and perhaps pull upon the perpendicular plate of the ethmoid bone, that we may bring down any part of the horizontal plate which may be irritating the brain. In the mean time, by every means in our power, we ward off inflammation. Happily the case is not likely to occur.

SECTION XVI.

OF HÆMORRHAGE.

THE ligature of arteries, and the stopping of hæmorrhage, is a subject of too much consequence in a practical work on surgery, to be left without some observations. In the present state of opinions it seems to be very necessary to attempt some statement which shall bring my readers to reflect on the just principle which is to direct our operations, and which, I must venture to affirm, is not to be discovered in the many dissertations which have of late been written on the ligature of arteries.

The principle which shall direct our endeavours in the stopping of hæmorrhage, will be discovered, if the question can be satisfactorily answered,—What is it which preserves the blood fluid in the vessels?

We cannot remain blind to this fact,—that there is a mutual influence established betwixt the blood and the containing veſſels; that a dead artery will have the blood coagulated in it; and that, even without

without the death of the coats, such a change may be wrought upon their usual influence, that the blood is coagulated as it passes through them. This effect is, I presume, produced by the loss more or less of that influence of the living vessel upon the blood which exists in a natural state, and which is calculated to preserve the blood fluid, and to facilitate its circulation.

It would not be difficult to prove, that if the blood in the circulation had the same attraction for the sides of the vessels, which it would have were they dead tubes, the force of the heart would not be sufficient for its circulation. But through the operation of the living power of the coats, the influence existing betwixt the blood and vessels is negative attraction: on the contrary, in a dead vessel or in a vessel greatly injured, this consequence of vitality is removed, and the blood adheres to and coagulates upon the sides of the vessels.

If an artery bleeds with open mouth, the surgeon can stop the hæmorrhage by injuring the artery. A torn artery does not bleed. I have heard it affirmed, that in this case the blood was stopped by the ragged portions of the inner coat of the vessel, which is torn into shreds by the violent elongation of it. It has been said, if we disclose the radial artery of a dead body, and, putting the probe under it, tear it forcibly up, the inner coat will exhibit an appearance like valves, to intercept the flow of blood. I believed in this statement; but upon the experiment being repeated, I found that in a young and healthy artery, the change could not be exhibited; so that

that I am forced to contradict this opinion, and to attribute the effect of the tearing an artery in stopping the flow of blood, to the same cause that operates when violence of another kind is committed upon it; as when styptic or the actual cautery is applied: besides, it is not only drawing out an artery, but also pinching it, that will stop the flow of blood through it; and the blood will be stopt, although the mouth of the artery remain uncontracted.

When an artery is opened, the more profuse will be the hæmorrhage the less injury the vessel has suffered. The artery of a mortified part does not bleed; the artery of a bruised part, or an artery cut by a ball, bleeds much less than when opened by the knife or lancet, or cut with glass; even a corroding ulcer, the inflammation of which does not extend far around, will open a blood vessel so as to occasion profuse hæmorrhage; but when we produce upon this ulcer a higher and more extensive inflammation, which is propagated to the coats of the vessel, we stop the flow of blood: an artery which has been cut with a sharp instrument, and which bleeds freely, being bruised or injured, soon ceases to bleed, and is like the artery opened by a contused or lacerated wound. In short, the facts may be multiplied to shew that there is an influence of life in the coats of an artery, which prevents the blood adhering and coagulating within it; but that when this natural influence is destroyed or disturbed, presently the blood coagulates within the vessels, and if the ves-

sel be of a moderate size, the flow of blood is obstructed.

It is incomprehensible to me, how this subject of hæmorrhage should have been pursued by experiment and observation so unremittingly of late years, and only the mechanical obstructions to the flow of blood noticed. But this is no place to examine opinions critically.

I now proceed to consider the subject in a practical view.

SOME OBSERVATIONS ON THE STOPPING OF HÆMORRHAGIES.

The pupil will soon find that, from an oozing of blood, a very great quantity of blood may be lost without the patient fainting, because whilst the blood flows thus gradually, the vessels contract equally over the system, and the heart and great vessels of the chest do not feel the loss, nor suffer any collapse. But when a great vessel is wounded, a few pulsations, the losing of a few ounces of blood, will so drain the heart, and great vessels of blood, that the patient immediately faints.*

* Thus I have seen in amputation, high in the thigh, in consequence of a mistake in the application of the tourniquet, a few jets of blood, full from the crural artery, followed by a deep groan, and a fatal fainting. The man did not, indeed, immediately die, but he never recovered. It does not require the bleeding of an artery to produce this sudden effect. The bursting of a varicose vein in the thigh, in the course of which the valves have lost their power, has been suddenly fatal from the descent of the whole column of blood which should supply the heart. The circulation within the head is instantly affected by that tension which prevails naturally in all the vessels being suddenly taken off.

 A friend

A friend seeing the patient faint, catches him up, but the surgeon lays him horizontally, by which means the blood flows more easily from the extremities to supply the heart, and the ascent of the blood to the brain is facilitated. Cold water sprinkled on the surface causes a contraction of the extreme vessels, and a shock to the relaxed surface, which throws the blood to the centre, at the same time that it excites the nervous system.

The surgeon will not endeavour to revive the patient from his fainting fit before he has secured him from a return of the hæmorrhagy; he will often have to take advantage of this suspension of animation and feeble state of the circulation, to accomplish the ligature of the vessel.

During hæmorrhagy, there is an undulating, soft, and compressible pulse. When the bleeding is extreme, and passing to a dangerous state, the paleness of the face is accompanied by an anxious wildness or delirious look, which should command immediate attention.*

A very distressing occurrence is, the bleeding from ulcerated surfaces, from deep, ill-conditioned wounds, or from the cavities of bones. When a sore takes a sloughing disposition, it sometimes lays open great arteries. If the needle be used, it is driven amongst soft and dead or yielding parts, and the vessel again bursts. This hæmorrhagy occurs in a state of the system, in which the loss of a few ounces of blood may be fatal. Sometimes we have it in our power to tie the trunk of

* These marks become particularly important in internal hemorrhagy.

the artery; for example, when there is secondary hæmorrhagy after amputation, in which the styptics and dossils of lint, and the graduated compress and bandaging will avail nothing, and in which the tying of the bleeding artery will be attended with repeated and sudden bursting forth of the blood, — in this case we must make an incision through the sound skin of the limb, and tie the artery.

It is chiefly in bleeding from spongy fungous surfaces, or from sloughing sores or wounds, that styptics are used; they are applied on lint, and above them a sponge and bandage. The styptics in use are oil of turpentine, or tincture of myrrh, allum in powder, or allum and emetic tartar. In the extirpation of spongy tumors from the jaws, with obstinate bleeding, or in bleeding from bones, the actual cautery is still used.

A very small artery in a bone will throw out a profusion of blood; the reason is, because the connexion of the bone does not allow the vessel to retract, nor pressure to be applied. If in this case we can take hold of the vessel with the forceps, and bruise it; or pull it out smartly, and tear it, it will cease to bleed. If there be bleeding from the cells of bone, as in the jaws, or in the sockets of the teeth, wax kneaded into them has succeeded in stopping it.

When a small artery (for example, the temporal artery) is only partially cut or torn across, it will continue to bleed until it be entirely cut across and allowed to contract.

When a cancerous tumor bleeds, our only resource is to put a piece of rough lint upon the part, and to compress it steadily for some time with the finger.

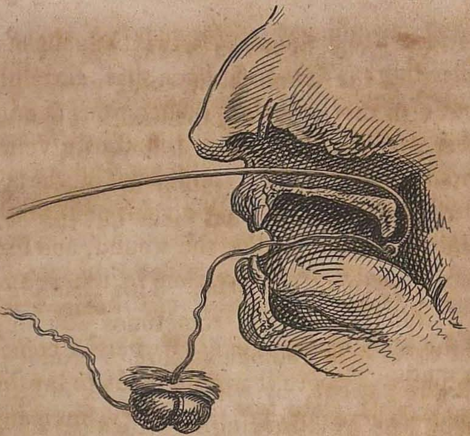
I have been greatly alarmed by the bleeding from an ulcerated callous surface, where neither pressure, nor the sponge and lint, nor styptic, such as I could in the circumstances apply, availed. On one occasion I introduced a common sewing needle into the neighbourhood of the bleeding spot, and round it cast a thread, with the common double or surgeon's knot, and drew it tight so as to stop the bleeding. I have since repeated this, and find it very useful on many occasions. You cannot withdraw the needle in this case without the ligature slipping, until the part has inflamed and hardened. It may be used in bleeding from the ulceration of the glans penis, and where the preputium is destroyed. Where there is bleeding from the extremity of the penis, the preputium being entire, it may be drawn over the penis and held, or even tied, as Ruysch taught a surgeon of Amsterdam to do.

When there is bleeding from the penis, or urethra, in consequence of the use of the caustic, either the fear or the local excitement produces a kind of erection, or at least fulness, which must be subdued by pouring cold water from a tea-kettle on the glans penis.

When from some deep part there is a continued oozing of blood, which we cannot suppress, continued, perhaps, from day to day, from a fungous surface,

surface, the patient becomes weak, the countenance pale, and the whole skin cold, white, and transparent : in this situation, the health is ruined, though there is not immediate loss of life. We are tempted to supply the system by nourishing diet, by rich soups, and animal food, but this only perpetuates the hæmorrhagy.

Hæmorrhagy from the nostrils. This bleeding is often very troublesome, and sometimes alarming. In slighter cases it is a sufficient cure to produce a chill upon the patient, by what means is of little consequence ; as by throwing a little cold water upon it, or by putting his hands in cold water ; but he must at the same time be drilled, and made to stand upright, and hold up his head, for the blood dropping from the nose, he naturally pokes forward and hangs his head, by which the veins in the neck are compressed, and the bleeding continues in consequence of the obstruction to the return of the blood from the head ; by way of insisting upon this, I have made them gargle their throat with cold wine and water. We at the same time introduce, by a probe, dossils of lint moistened with vinegar or spirits, into the nose, or even draw them through the back part of the nostril. Should the bleeding advance to an alarming degree, we can stop the cavities of the nose in this manner. A piece



of wire (a catheter wire for example) made with an eye to convey a double ligature, is thrust into the nostril until it appears in the throat; to facilitate which, it ought to be curved near the end, that it may turn down behind the velum; then with a pair of forceps, or a hook, or the finger, the ligature is seized and drawn into the mouth. Having prepared a piece of sponge, or a dossil of lint, such as will just plug up the posterior opening of the nostril, we tie this to the ligature, and draw it through the mouth into the back of the nose; then closing the anterior nostril by plugging it also, and tying the ends of the ligature over the plug, no blood can escape. This operation may be particularly useful after the extirpation of polypus tumours from the cavities of the nose. Another and better method of stopping bleeding in cavities is to introduce a gut, and forcibly distend it so as to compress the bleeding surface.

 It

It is necessary to distinguish betwixt venous and arterial bleeding. The difference has certainly been sometimes overlooked, and operations fit only for arteries performed for the wound of a vein! The blood flows uniformly, and is of a darker colour when it proceeds from the vein, and it may be stemmed by pressure below the wound, and can always be stopped by compression in the wound itself.

Where the bleeding is *venous* — where it comes from deep parts — where it is dangerous to lay the bottom open—where not one large artery, but many lesser ones are wounded, then the sponge and graduated compress ought to be used; as in the welling out of blood from vessels lying deep under the angle of the jaw, or in the axilla.

In the use of the sponge, there are some circumstances which, if attended to, may save the patient from much distress. The sponge ought always to have a string attached to it, lest we be obliged to allow it to remain, when it will not be easily withdrawn from the cavity. A lesser piece should be placed immediately on the bleeding point; a larger one over it, filling the wound. The larger one may be taken away at an early period, while the lesser is suffered to remain. Sponges ought to be removed at the commencement of suppuration in all cases; otherwise the granulations shoot into them, and they are not afterwards to be brought away without pain and bleeding. They are dangerous when allowed to lie long in contact with the bone. I have seen caries of the ribs produced by

by allowing sponges to remain too long in the axilla.

In wounds received in battle, and attended with hæmorrhagy, much mischief must proceed from the application of the tourniquet. It totally deprives the limb of circulation; and, if the wounded man is for a short time neglected, the limb must irrecoverably suffer. Besides, every man does not comprehend the application of the tourniquet, when he could apply a broad bandage, after pushing a sponge or cloth into the bleeding wound.

The slightest and the most dangerous hæmorrhagy may be stopt by introducing a dossil of lint into the wound, over this a compress and sponge, forming the graduated compress, and binding all down with a simple strap. By this means the circulation will not be totally interrupted, which it may otherways be, on account perhaps of a wound in a trifling artery, or a venous bleeding only. Wherever we bind up a limb to suppress the hæmorrhagy from a considerable vessel, the roller should be applied with a certain degree of tightness to the limb, below the part firmly compressed; and after all it must be carefully watched, or the swelling which naturally comes upon the limb will have an effect equal to the most powerful drawing of the compressing bandage, and produce gangrene.

When the wound is open, or the limb shattered, no better tourniquet can be required than a towel, or strong pocket-handkerchief: first throwing a double knot on the middle of it, we apply the knot on

on the course of the main artery of the limb, and tying the ends of the handkerchief round the limb, we include the handle of a sword in the doubling, and twist it until the bleeding stops. From the flap of a saddle, the girth, and a small piece of stick, a very sufficient tourniquet for any purpose may be contrived.

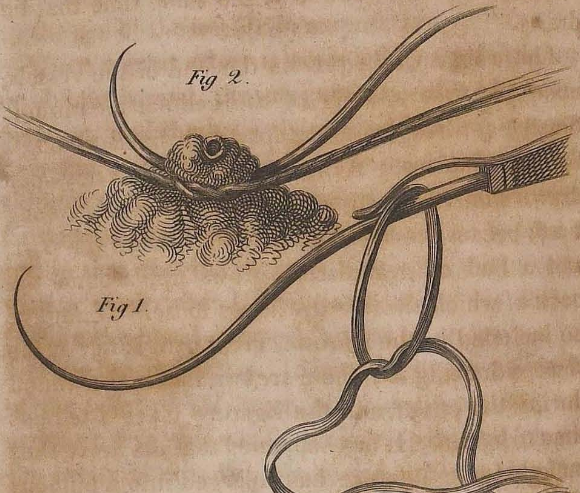
OF THE NEEDLE AND TENACULUM.

If an artery situated amongst loose cellular membranes bleeds, it should be tied if possible. If we use only compression, and it do not succeed, the retraction of the artery, and the flowing of the blood among the cellular membranes, and the masses of coagula, make at last a very confused surface. Where an artery lies against a bone, we may with more propriety trust to the compress and bandage.

In clean cuts, and especially in surgical operations, we should be able to judge of the size and force of the artery from the jet of the blood, and we should take it up at that moment if we judge it necessary at all. By the pressure of the finger, it is made to bury itself among the fat and cellular membrane, or by allowing it to bleed, it exhausts itself. But in both these cases it may be stopped, only during the faintness, cold, and dread which the patient suffers, and though the vessel may not be discoverable again before the flaps are laid down, yet upon the revival of the patient, and when he is put into bed, the blood breaks out again, and requires the whole dressing, of the wound to be undone.

The

The tenaculum is an instrument in common use for drawing out the artery in open wounds, so as to enable the surgeon fairly to tie its mouth. I have given what I conceive to be the necessary curve to it, making the curve a little more acute towards the point, to enable the surgeon to catch the mouth of the artery more easily.*



The tenaculum is put into the surgeon's hand during an operation, with the ligature hanging on it thus, (fig. 1.) He catches the artery, and pulls

* For country practice, or the use of the army surgeon, where there may be occasion to tie an artery without the aid of an intelligent assistant, the curve of the tenaculum should be a full half-circle, and the handle made heavy, that it may hang so as to draw out the artery whilst the surgeon ties it.

it

it out, and the ligature is brought down towards the vessel by the assistant, and tied (as in fig. 2.) If the artery is large, or lies deep, then it is transfixed, and the curve of the instrument directs the ligature into the bottom of the wound. In drawing the ligature, the assistant should, with his forefingers placed on the ligature near the knot, push it down into the wound, at the same time that he draws.

Large ligatures slip from the end of the vessels, upon the first wasting of the cellular membrane. Small ligatures are more apt to be fixed amongst the granulations. A ligature which has not been drawn sufficiently tight, sometimes remains a long time, because it does not entirely deaden the part, and a bud of granulation grows up, around the neck of which the ligature hangs loose. If a nerve be included in the ligature, great pain is felt at the time of drawing it; there are twitches in the wound during the cure; and the ligature takes a tedious time to loosen. It has happened that the nerve thus included in a ligature has enlarged into a bulbous end; and this, like a button in the noose of the ligature, it has detained it for months. To separate a ligature which remains too long among the granulations, the surgeon twists it at each dressing.

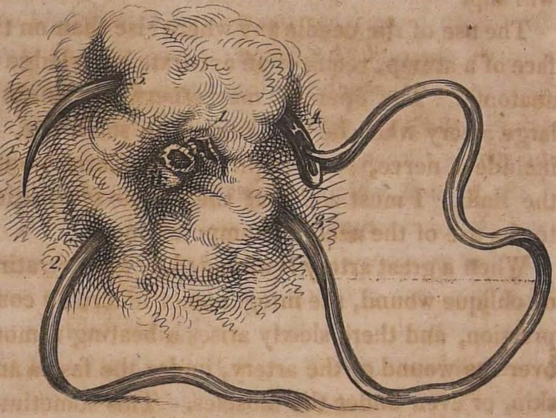
To cut out a ligature which remains perhaps attached to a nerve, and which keeps the wound unhealthy, you must soak and separate the two ends of the ligature down to the knot; then move the blades of the scissars along one of the ends until you are close upon the knot; and, after cutting it,

it, by pulling gently on the remaining end, the knot will slip.

The use of the needle any where else than on the face of a stump, requires an accurate knowledge of anatomy. The operator may otherwise transfix a large artery when he is taking up a small one, or include a nerve, so as to produce a contraction of the limb. I must add that there is no temptation to the use of the needle in amputation.

When a great artery is wounded by a penetrating or oblique wound, the integuments adhere by compression, and there slowly arises a beating tumour over the wound of the artery, under the fascia and skin, or even under the muscles. This sometimes happens where the tourniquet cannot be applied; and in that case the surgeon is to open the tumour with a small wound, and introducing his finger (before the blood escapes), he has to endeavour to feel the beating artery. Securing, by the pressure of the point of his finger, the bleeding orifice, an assistant lays the whole tumour open, and clears the cavity of coagula: the surgeon then taking the needle, passes it round the vessel, and the assistant ties it.

The needle is now laid aside for the purposes formerly in use. This is the way of using the needle on flat surfaces:—



(1.) Is the bleeding orifice. I introduce the curved needle at (2), and bring it out at (3), passing it through the cellular membrane. I introduce it again at (4), on the other side of the vessel, and bring it out at (5), some distance from (2): then, by tying the ends of the ligature, I am enabled to draw the cellular membrane like the mouth of a purse, so as to include the bleeding artery.

Either after an operation, or in a wound where there have been many vessels tied, we should assort our ligatures; and if we have not twisted and tied the ends of each ligature together when they were drawn, we should do it now, for the convenience of dressing. When the parts are brought together, the threads should be left hanging, if possible, in the depending part of the wound.

If

If we are anxious to procure adhesion, and there be so many and large ligatures, that if they were allowed to hang from the wound they would necessarily obstruct the union; then, by separating the threads of which the ligature is composed, we may cut short the greater part of it, so that only one strong thread remains hanging from the lips of the wound, which will yet be sufficient to pull away the ligature in due time.

Unless we consider the effect of a ligature upon an artery, our practice will be apt to vary with every fancy which is offered. To the full effect of a ligature upon an artery, it is necessary that the mouth be securely closed, and the thread in close contact with the coats of the vessel. In tying an artery firmly, the inner coats are cut through; but it is a mistake to suppose that this is necessary to the union of the coats, or that there must be as it were an incised wound to secure the adhesion of the sides of the vessel. When this notion was first broached, I cautioned my pupils against the next step. I thought an attempt would be made to tie a ligature on the artery of an aneurismal limb, and take it off again; this has been since done and failed. I at the same time shewed, that although any sort of injury to the coats of a vessel would in certain circumstances cause a coagulum to form and the artery to be closed, yet that so far from the cutting of the inner coat being the sole means of producing the union by ligature, it was not even necessary; for if the ligature was cast about an artery, and left without being drawn, so that the blood

blood might still pass it, the consequence will be the inflammation of the coats, the formation of a coagulum, and the final closing of the vessel.

The rule of practice is this: proportion the ligature to the size of the artery, draw it firmly, that it may not be pushed off the end of the vessel, and take care that the ligature is in contact with the coats of the artery, for if much cellular membrane intervenes, or the sheath of the vessel is betwixt the thread and the proper coats, the ligature is not only more apt to slip, but the artery does not partake of that inflammation which is necessary to the final suppression of the bleeding; and as we proceed we shall find the same principle ought to influence us; for example, if a compress is put down in contact with the mouth of an artery, it will not only close it more effectually, but it will occasion that inflammation in the coats which will finally secure the bleeding orifice; on the contrary, if a fascia or mass of cellular membrane, or even a coagulum of blood intervenes betwixt the compress and the vessel, the blood will flow when the bandage is relaxed.

RULES FOR TYING ARTERIES WHEN DIVIDED IN WOUNDS, AND A DESCRIPTION OF THE MANNER OF DISSECTING FOR THEM.

I AM aware that some may conceive that this chapter contains matter foreign to the nature of a system of surgery. I cannot agree with them: I write

write for my pupils in the first instance, and I know in what they are most apt to err. Although I take all possible care in my lectures to teach my pupils a proper and correct way of studying the arteries, yet I find them deficient in this branch of surgical anatomy, without which their other knowledge is useless. I think I was the first who taught my pupils the anatomy of the arteries in partial views, cut down upon them, and endeavoured to shew them in their natural confusion, and as they are seen in operation. I have done this in the hope that my pupils might not be at a loss when they came to seek for bleeding arteries in the living body, as those are who have been taught the anatomy of the arteries on dried preparations, or at most, shewn them on the injected subject, after the dissection of the parts.

I conceive that even the title of this chapter may be of some use, by informing those who seem willing to forget that such things are necessary to be done sometimes; by causing them to reflect that the very first occasion they may have to wet their hands in blood, may be to stop a hæmorrhage from the brachial or femoral artery. For young surgeons are often in situations which require decision and dexterity, when the older members are placed where business may be done with deliberation and the characteristic gravity of the profession.

CLASSIFICATION OF THE ARTERIES IN THE ORDER OF THEIR IMPORTANCE TO THE SURGEON.

Class I. *Arteries, the wounds of which are necessarily fatal.*

The aorta, and pulmonic arteries—the arteria innominata—the cœliac—the superior and inferior mesenteric—the splenic—the emulgent—the common iliac, and the external and internal iliac arteries, and the common carotids near the aorta.

Class II. *Arteries from which the bleeding is fatal if the vessel be not immediately stopped.*

The carotid artery—the femoral artery—the axillary and brachial arteries—the profunda femoris and popliteal artery.

Class III. *Arteries, the bleeding from which is profuse and dangerous, and which require the ligature.*

These are the arteries of the leg—the ulnar and radial arteries—the gluteal and ischiatic arteries—the sub-scapularis—the thyroid and lingual arteries, and the branches of the profunda femoris.

Class IV. *Arteries which require careful compression, and if that be not possible, the ligature*—the internal pudic—the epigastric—the arteries in the sole of the foot and palm of the hand—the interosseous artery of the fore arm—the intercostal arteries—the temporal and facial artery, and occipital arteries.

Class v. This fifth class of arteries are those that may be troublesome only in cases of great weakness, or when there is something peculiar in their situation, as those which are engaged in bones.

I.

If there be bleeding from the hand or foot, and the surgeon is called soon after the accident has happened, and before any clumsy attempts have been made to stem the bleeding, he may put down a piece of sponge into the wound, and then a graduated compress being applied, the vessel will be effectually closed. But if the blood has been driven from the mouth of the artery into the cellular membrane, and under the aponeurosis, the compress cannot be used with accuracy and effect; neither can the tenaculum be used, because the mouth of the artery is hid; and the needle cannot be used, because the mouth of the bleeding artery is amongst nerves and tendons. So it happens that a wound of a trifling artery in the hand or foot often requires the ligature of an artery of greater size at the wrist or at the ankle.

My reader now inquires whether all wounds of the arteries of the foot and hand require a ligature? Certainly not; they will often stop bleeding, and they can be compressed. I have seen the hand pierced and shattered in all directions by balls, and no ligature required. I have seen in the same day

day three gun-shot wounds through the palm of the hand, without hæmorrhage, or more than was to be wished for.

But in the use of a compress, this is not enough considered — that inflammation as well as pressure is required to obliterate an artery. If there be a considerable thickness of cellular membrane, or a fascia, betwixt the lint or sponge and the artery, the pressure may very likely fail, whereas if the compress had been put down in contact with the artery it would certainly succeed; for then the pressure not only keeps the sides of the vessel together, but, as I have already explained, the contact of the foreign body causes inflammation and adhesion.

It will accordingly happen that the ulnar artery being wounded where it forms the arch in the palm of the hand, we shall in vain try to compress it; because the cellular membrane is charged with extravasated blood, and the artery has shrunk under the aponeurosis: the compress does not touch the artery, and there is a great thickness of a substance like placenta over it. On another occasion, finding an open wound, and the artery displayed, and no such driving of the blood into the palm of the hand, and no such general swelling as I have described, the compress being put down into the wound and the hand bound over a ball of cotton or lint, the hæmorrhage will be effectually suppressed.

II.

It is more difficult to say what size of an artery requires a ligature than may be at first imagined. It is very likely that while I am describing the manner of cutting down upon the arteries of the third class, the tibial or fibular, or ulnar arteries, a naval surgeon may say, "All this is superfluous, for I have stopt these arteries by compression." I must shew that I know this, and yet that I deem it sometimes necessary to take up these vessels with the needle.

John Roe was shot in the arm and in the breast. He stood with the tackle in his hand ready to help in running out the gun, when a shower of grape-shot shattered the men at the gun, killed two and wounded four. Roe felt his breath gone, and was sensible of a shot in his breast. The shot had passed through his arm, breaking the ulna above the middle, and wounding the ulnar artery; it then passed obliquely over the scorbiculus cordis, very critically passing betwixt the muscles and skin. Although there were circumstances in that wound of the breast that might be interesting, yet it is to the wound of the artery only that I have at present to call my reader's attention. The finger could be put into the wound by which the ball entered, as well as that by which it passed out of the fore arm. These wounds were filled with lint, compresses laid on each, and a tight roller applied. There

There was at first no pain; very little even when the surgeon thrust his finger deep into the wound; but in half an hour the patient felt the bandage tight, and became sensible of the cramming of the wound and soreness. The shot holes were black at the second dressing; the dossils of lint were drawn out, but he had no recurrence of hæmorrhagy.

It may be said that there was no absolute proof that the ulnar artery was wounded in this instance: in my opinion it was complete; but there can be no cavil about the following instance. M'Kenzie was on the covering party, on the retreat from Villa Franca, and while reloading his piece he saw a sharp-shooter of the enemy take his aim at him; the ball struck him in the fore arm; for the space of three miles of the retreat he bled freely from the wound, but on finding the surgeon the arm was bound up and the bleeding was stopt and did not return. When I looked on this man's arm some days after, I was assured that the ulnar artery was in the direct course of the ball, and that it must have been cut through: the ulna was shattered, and many loose pieces lay in the bottom of the wound. I was confirmed in my supposition of the artery being divided, by the unusual irritation and pain in the wound, which I attributed to the ulnar nerve being cut across, and now engaged in the fungous and ill-conditioned sore. The arm was amputated: very improperly. When I examined the arm, I found the ulnar artery and nerve cut across, and on introducing the probe into the

 artery,

artery, I found it stopt for the length of an inch and a half, in part owing to the contraction of the artery, but principally from the adhesion through coagulable lymph.

I could give other cases of wounds which I have seen of the ulnar and radial arteries thus easily stopt by compression; but what I have said is sufficiently conclusive on this point, viz. that where these arteries are divided by gun-shot, compression is sufficient to stem the blood. I give here a sketch of a wound of the lingual artery, which being of the second order of arteries also, is I think conclusive on this head.

The ball shattered the angle of the jaw, passed obliquely through the tongue, and came out by

 the

the edge of the mastoid muscle of the other side. This wound bled for half an hour and then stopped. I judge that the lingual artery was wounded here, first from the course of the ball, as apparent to the eye; but also from this circumstance, to which I was careful to attend, viz. the insensibility of the left side of the tongue, which implies that the nerve was cut.

III.

THE next inquiry which the intelligent young surgeon would naturally make, respects the necessity of tying arteries of the third class, when wounded by a splinter or by a knife. The first question is not so easily answered as the second; let us for example take the following case:—In Lord Duncan's victory John Neil was stationed at a gun, when a shot struck a bulk-head, and drove it in splinters, so as to throw down and wound all the men at the gun; Neil was cut about the breast and throat with splinters, but not deeply. He went to the next gun and wrought at it; when as he carried a forty-two pound shot betwixt his hands, a shot passed through the ship, and a very large splinter struck his arm and made him quit his hold. While he was looking at his arm two men were dashed against him, and all three tumbled down the hatchway. Neil was much sprained and bruised in the back by his fall *. When he could, he crawled into the cockpit,

* The reason I transcribe these circumstances is to bring my reader acquainted with the very different kind of wounds aboard

cockpit, and found his arm bleeding very profusely. There were two wounds on the outside of the elbow-joint, through the belly of the supinator muscle. In one of them a large splinter was sticking, which Neil, while he waited his turn to be dressed, endeavoured to pull away, but could not. It was from this wound the bleeding proceeded: it was like a ball wound, and admitted the point of the finger, and was very deep. When the firing ceased the surgeon set this poor fellow in a great chair, while he took his arm and tugged at the great splinter ineffectually. He therefore, at last, cut the wound open on one side, so as to free it, and it came out easily. If he had carried his knife into the other wound, which was close by it, he would have done good, for it afterwards appeared that there were many splinters in it, buried deep in the flesh, though not to be felt with the finger when it was pushed deep into the wound. Both wounds now bled profusely; the surgeon crammed them with flour, and laid a compress and a tight bandage over them. During two nights and two days the bleeding was so profuse as to indicate a wound of the ulnar artery; but partly because the bleeding was in some degree commanded by the compresses, and partly from want of assistance, the surgeon did not undo the bandage. Neil was by this bleeding reduced very low. When the

---

aboard ship, from those to which the soldier is exposed from grape and musket shot. The case is communicated by my brother.

bandages were undone on the third day the bleeding had stopped.

In this case we have a wound in the same arteries, but in circumstances materially different. The splinter of wood, although driven with the force of a bullet, yet wedged and cut its way no doubt; and while a ball, being round and obtuse, bruises as it passes, this splinter cut the artery. The bleeding was however stopped; but if the artery had been cut by a knife, it might have been more difficult: to shew which, I subjoin the following note of a case of wound of the radial artery, proving that a man may die from it.

IV.

A GENTLEMAN was wounded in the fore-arm by a pistol shot. The arm swelled prodigiously; abscesses formed in the fore arm; and it was thought necessary to open them freely, and to rip up the fascia: in doing this, unfortunately, the radial artery was touched. The bleeding was profuse; and from the weakness of the patient, critical: my reader may conceive from what has been described, that nothing would be so easy, as to compress this artery; but let him consider things as he will find them in practice. The man's arm is swoln to half the size of the body; great abscesses are in it; it is inflamed and so painful, that a heavy foot in the room, or the lifting of the thumb of the patient, gives excruciating pain. It is evident that the wound cannot be effectually stuffed and compressed

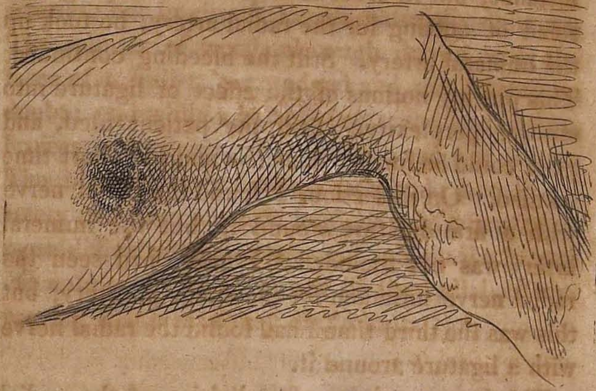
pressed when in this state. I know not on what grounds the surgeon determined in the preceding instance, but in order to stop the hæmorrhage, instead of cutting for the radial artery, he took up the humeral artery. Still the bleeding continued. This put my notions of the effect of ligature into strange perplexity. Still the patient bled, and what could be further done?—and in a short time he died. On dissection, I found the radial nerve with a firm ligature around it, but the humeral artery was not included. I never had seen the radial nerve mistaken for the humeral artery, but this was the third time I had found the radial nerve with a ligature around it.

This is a pure case of a division of the radial artery, by the knife, proving fatal; and these cases leave no room for conjecture on the difference between gun-shot wounds, those by splinters, and the clean cut of a knife. It is in this latter case especially that we have to cut down upon the artery and take it up.

V.

I HAVE stated that the branches of the profunda femoris require the ligature: but from the difficulty of the dissection, the uncertainty in regard to the branch which bleeds, and the precise place of it, we shall be long held in suspense, and perhaps obliged to trust to compression. In gun-shot wounds the case is still more perplexing.

In



In this slight sketch I have represented the place of the wound of J. Chambers, of the rifle corps. He was wounded in the retreat at Villa Franca: the ball entered under the edge of the sartorius muscle, passed obliquely through the flesh of the thigh, and round the bone, and lay under the skin near the trochanter major. The wound bled freely on his first receiving the shot. He was thrown on a mule, and for three leagues on the retreat he continued to bleed. The surgeon cut out the ball, and bound up the limb, and then the bleeding stopt; but it broke out again, and continued to bleed for ten days; and after this, when aboard the transport, there was great bleeding, so that they were obliged to apply the tourniquet, &c. The wound continued to bleed till within two days of his coming ashore.

A wound

A wound of the femoral artery would have prevented him from ever rising from where he fell. This has been a wound of the branch of the profunda, which descends before the insertion of the long head of the triceps, and which is behind the great artery; yet although a branch, it is as large as the brachial artery, and its importance is shown by its continuing to bleed for thirteen days,—from its requiring the tourniquet eleven days after the wound was received. This artery, however, was at last stopped by the compress and roller; but had it been cut with a knife, the bleeding would most probably have been fatal in the first instance, if the artery had been left unsecured.

VI.

It will not be denied, (though I know not where the important fact is to be found distinctly stated,) that it is not so much the size of the artery which makes it to be dreaded, but its comparative size; and this not in comparison with the size and years of the patient only, but its principal importance hangs on the question whether — is it the main artery of a limb, or a branch? From a branch of the profunda, equal to the brachial artery in size, the man is less likely to bleed to death, than if the wound is in the brachial artery.

VII.

If a man is wounded in the main artery of the thigh, or arm, from the weapon entering in at the outside of the limb, it must be evident that the original wound cannot be enlarged to seek the artery, as has been proposed. To take the most favourable case for this proposal; if a man be wounded through the flesh of the triceps, and the sword pass into the humeral artery, we cannot dilate the wound to expose the puncture of the vessel. We must pass the gun-shot probe into the wound, and pass it forward until we can feel its point on the skin on the inside of the arm, and near the artery. Here we cut upon the artery, and make sure that this incision communicates with the original wound; and if we do this, there can be no embarrassment from the artery continuing to bleed by the wound towards the outside, while we are dissecting for the artery on the inside of the arm.

If in searching for the wound of an artery the blood does not flow, although you are sure that the side of vessels is wounded, compress the artery below the supposed place of the wound, and the blood will start out.

VIII.

When we cut down upon the artery of a limb, and having found it, are about to separate the vein and

and nerve from the artery, we must bend and relax the limb; by inattention to this rule I have twice seen the radial nerve included in the ligature put around the brachial artery.

IX.

It does not appear to me that surgeons have determined whether a single or a double ligature be required in case of a wounded artery. I am sure that some may entertain these difficulties: viz. whether in certain cases a ligature being put around the artery above the wound, the patient is quite secure? or is it necessary to tie the lower part of the artery also? On this subject, I shall state what appears to me to be the fact, and endeavour to draw the safe rule of practice.

While these papers are before me my assistant is called to take up the radial artery, where it has turned from the fore part of the wrist. He finds a man with a deep wound of a knife betwixt the fore-finger and thumb: the man has already lost much blood; and introducing the probe, it is found that the point of the probe is at the head of the metacarpal bone of the thumb. The artery is taken up by the side of the extensor tendons of the thumb. The bleeding is stopped, yet in a short time the blood flows again; but the wound being tied up, with a compress laid in the course of the wound, all is well. It appears from this, that when a man is bleeding from an artery of the hand, or wrist, or foot, tying the trunk of the artery

tery only diminishes the impulse of the blood, and does not entirely stop the flow of blood, which comes round by the very free inosculations. But the direct course of the blood being interrupted, our dressing is sufficient to stem the force of the hæmorrhagy by the anastomosing vessel. If the artery be not taken up, a sponge must be thrust deep into the wound, and a tedious sore is the consequence; but if the main supply be stopped, the lips of the wound can be brought together, and the compress put over the integuments, (not into the flesh,) and the wound heals by the first intention.

If the surgeon be brought to a man who has received a wound in the inside of the arm, and he has reason to suppose, from the dashing of the blood, that the humeral artery is wounded, ought he to be satisfied with pulling out the artery from the bloody wound, and tying it? Supposing that he distinctly sees the extremity of the artery, and the blood flowing from it, is it sufficient to tie that mouth of that artery? I believe, that with common care afterward, and due compression, the patient will not die of hæmorrhagy; but I am at the same time convinced, that when the principal artery of a limb is thus severed, or wounded, a ligature ought to be applied both above and below the wound; and then only can the limb be left free of bandages and compresses, which in this case is especially necessary. Tight bandages not only prevent the early union of the cut, which is a minor consideration, but they do not allow the free circulation through the limb by the collateral arteries, now

that the main trunk is cut and tied. When the main artery of a limb is tied we expect the free course of the blood by the anastomosing branches still to supply the lower part of the limb; and surely, when we are so confident of this expectation, we cannot doubt the propriety of tying the artery both above and below the wound, so that there may be no fear of hæmorrhagy from the returning blood, and no necessity for a compress to be put into the wound.

X.

A QUESTION may still remain with my reader in the case of a wound of the fore-arm, or leg—when the ball has torn both arteries what is to be done? I take particular pleasure in producing the following case, presented me by Mr. Torbitt of the Crescent, formerly a pupil of mine.

A CASE OF DIFFUSED ANEURISM WHICH HAPPENED AT THE SIEGE OF DANTZIC, MAY THE THIRD, 1807.

A POLISH pilot was offered a pecuniary reward, from the British Consul, to carry dispatches from General Kalkruth, commanding the garrison of Dantzic, to General Kaminski, commanding the allied Russian and Prussian army in the Fair Water. On his passage in an open boat down the Vistula, he was fired at by the French sentinels from both banks of the river, and received a wound from a

 musket

musket ball, which entered the left arm from without, about two inches below the elbow joint; the ball made its exit at the lower end of the ulna, passing through both radial and ulnar arteries. A profuse hæmorrhage followed, but he continued to exert his strength to get clear of the sentinels, until he fainted from the loss of blood; the boat was drifted down by the current into the Fair Water by the time he recovered. He made another effort and regained the shore, but weak and worn out by the loss of blood he fell down, and was taken up by a Russian out-post, and conveyed to an inn. A compress and roller was applied, and his strength supported by wine and a nourishing diet; the arm became much swelled and painful; fresh bleedings from the wound followed every two or three days, and then fresh bandages or compresses were added to the former, until the seventeenth. I was called in to visit him. I found him pale, with a livid countenance, and his eyes sunk in his head; his pulse in the right arm was one hundred, and upwards, and scarcely perceptible; the hand was much swelled, and soft to the touch, as if pus were formed. I recommended amputation; dreading from the length of time, and the state of the cellular membrane and muscles, that mortification was approaching. A consultation of English and Prussian surgeons was held at six o'clock the same evening. I entered the room a few minutes too late, when a Prussian surgeon was undoing the last turn of the roller; the blood sprung from the wound across the room; the surgeon stood amazed,

—without making any endeavour to stop it. I laid hold of the arm, and compressed the artery on its passing out of the axilla, and applied the tourniquet. On exposing the arm, the whole appeared marked with the roller, whose spiral pressure left evident marks of its inclosing a fluid diffused among the muscles, and the arteries still continuing to bleed internally, I amputated the arm above the joint, which the patient endured with great resolution. I gave him an opiate, and ordered him a glass of port negus three times in the course of the night.

Dissection. I made an incision in the course of the wound, and found both arteries wounded, and the whole of the interstices of the muscles filled with coagulated blood; and continuing the incision from the lower wound, down into the hand, four ounces of well-digested thick pus escaped; I made another incision on the back of the arm, and found the blood equally diffused, the muscles and cellular substance appearing one black mass, with every sign of approaching gangrene.

The next morning I found my patient sitting up in his bed, quite chearful; pulse soft, full, and considerably reduced; fearful lest adhesion might not take place by the first intention, and having no after inflammation to dread from the great loss of blood previous to the operation, I ordered him a dram of bark four times daily. The second day I found him walking the room, without the smallest degree of fever; cautioned him to be careful, but did not confine him to bed. The fourth day I opened the stump,

stump, found that very little adhesion had taken place; a great discharge of coagulated matter from the stump; dressed the stump, and continued his bark as before. On the next dressing I found the matter better, and less in quantity than on the former dressing; the wound discharging a thick pus, and skinning over very fast. Continued his bark and dressings until the twenty-eighth, when the stump almost skinned over, but the French getting possession of the Fair Water, he fell into their hands to complete the cure, which only wanted a few superficial dressings.

There is always much difficulty in stating an aphorism in surgery; in other words, the circumstances of the cases are infinitely varied, and much is left to the discretion of the surgeon. A wound of the radial, or ulnar artery, makes no case for amputation, nor ought we to amputate although one of the bones, and one of the arteries were pierced by the ball. I have nevertheless seen it done. But where both arteries are torn by a raking shot, in the manner above described, there can be no doubt of the propriety of amputation; because to compress these arteries is to compress the whole arm, and to prevent all circulation; to take them up requires extensive incisions, and these incisions, in addition to the original wound, leave the arm too much mangled to recover.

To say, that in any case where the radial and ulnar artery are cut, the arm should be amputated, would be very wrong. The arteries may both be taken up; but when there is a raking musket-shot

 through

through the fore-arm, and the arm is swelled, and the cellular membrane stuffed with extravasated blood, and the patient reduced, the case is totally altered.

XI.

While on this subject of wounded arteries, I am tempted to state some further facts regarding the force of the circulation by collateral and anastomosing arteries.

A man having suffered a fracture of the lower head of the femur, had the misfortune, at a considerable distance of time, to have the popliteal artery torn on the rough projection of the bone. A tumour formed behind the knee; the progress of the swelling was more rapid than in the common case of popliteal aneurism. The operation for aneurism was performed on the fore-part of the thigh. By the tying of the femoral artery the swelling was only checked for a time; by and by it began to increase; the knee-joint became greatly distended; ulceration took place near the head of the fibula; and from this, pure blood escaped, so as to endanger the patient's life, and render amputation absolutely necessary.

In the amputation the femoral artery gave out its blood as usual, and was secured.—*On Dissection*, I found that the blood had continued to pass from the popliteal artery into the sac of the aneurism, and that the femoral artery was plentifully fed by the anastomosing vessels. The blood which

which escaped from the ulcer had come directly from the popliteal artery, in which there was a ragged hole. This proves, that in the case of common popliteal aneurism, where there is a proper sac, the ligature on the femoral artery checks, but does not altogether impede the course of the blood into the sac; it interrupts the main channel through the trunk of the femoral artery, while the blood continues to make its way circuitously into that part of the trunk of the artery which is below the ligature. This interruption to the blood, forcing it to take a circuitous route, gives opportunity for the entire coagulation of the blood in the sac, and then the cure takes place much in the manner of the spontaneous cure of aneurism. The preceding case, however, proves that where there is no regular sac, and where the artery is wounded and the blood diffused, this tying of the trunk of the artery high in the thigh, is not sufficient to stop the flow of blood from the wound of the artery.

I made another dissection which proved to me, that after the usual operation for the common case of popliteal aneurism, the main artery continues pervious below the ligature; and that it is the femoral artery and its branches, (and not the extremities of the profunda, articulating with the recurrent branches, from the artery below the aneurism,) which carries on the circulation. Six weeks after the operation for aneurism, it was neceffary, in consequence of partial mortification, and a caries of the fibula and bones of the foot, to

 ampu-

amputate the limb. During the amputation I observed the blood flow in full jet from the femoral artery, on the face of the stump. Now the artery was here cut across not more than two inches below the place of the ligature used in the operation for aneurism. On injecting the anterior tibial artery with wax, the injection passed freely into the branches of the popliteal and femoral artery. So it is certain that here the blood was carried into the leg by the trunk of the femoral and popliteal artery, and that the main vessel remained pervious betwixt the ligature applied in the operation for aneurism, and the sac of the aneurism.

It follows then, that where there is a regular sac of an aneurism, the operation usually performed will be successful, by diminishing the force of the circulation, and allowing the blood in the sac to coagulate. But that where there is an open wound in the artery, and an extensive irregular cavity into which the blood flows, this ligature applied so high in the limb is insufficient, and it will be necessary to tie the artery where it is wounded, or to amputate.

XII.

I cannot close this chapter without saying something of the secondary bleeding from gun-shot wounds, in consequence of the slough coming away.

In the first place, I positively deny that because a gun-shot wound bleeds, there must therefore be a

great

great artery wounded; for I have seen wounds of the thigh, of the axilla, and arm, by musket balls, where much blood flowed, and yet there was no secondary hæmorrhage, and no great artery wounded, as the event of the cases shewed.

It would be great presumption in me to contradict the opinion of Mr. Hunter upon a subject of this nature, yet as I have felt alarms in consequence of what he says and others think they have confirmed, and have found my fears groundless; I think it necessary to state, that while I would still take the precaution recommended by so many in regard to the secondary hemorrhagy from gun-shot wounds, yet I do not think there is that occasion for trembling anxiety, which I at first conceived there was. On a late occasion, when I went among the wounded from *Corunna*, I had two purposes in view, first, to satisfy myself on several points, of which I had just knowledge sufficient to make me doubt the received opinion; the other was, that I might have striking instances of acknowledged facts, for the purpose of teaching; and amongst other accidents I thought we should have secondary hemorrhagy. I hope it will not be irrelevant that I state from my notes the opinion as it grew.

"It is singular that of all the hundred wounds of balls in these wards, with the sloughs hanging from the wounds, there is no instance of hemorrhagy." In succeeding mornings I find still the same expression in my notes. "Now the slough is just coming out of several of these

 wounds;

wounds; in cases too where I should imagine the artery must have been touched, yet in bringing the men ashore there has been no bleeding. I see a man wounded in the sartorius very near the femoral artery. I see a man wounded where the ball has entered by the side of the insertion of the deltoid muscle, and passed out by the back of the arm, it must have gone betwixt the bone and the artery. I see another just brought in where the ham-string tendons are perforated, and it is miraculous that the popliteal artery could escape; yet in these instances no blood flowed on the coming away of the sloughs."

"I have noticed to-day a great many wounded in the axilla, some where the ball has lodged, some where it has passed through. I see a wound where the ball has taken off the preputium, and passed into the thigh, and over the femoral artery, and there was bleeding as I imagine from the ramus inguinalis magnus, but there is no secondary hemorrhage." "In the next bed a lad lies wounded on the inner condyle of the humerus; he was on the retreat, the firelock trailed, he received the ball on the inner condyle of the humerus, it was cut out upon the biceps. How did the artery escape? My inquiries were at last suspended. I found no instance of secondary hemorrhagy. I began to think it was equally incorrect to say that every artery touched with a ball must slough and bleed, as it is to say that every bone touched by a ball must exfoliate."

In

In examining these fine fellows it was often exclaimed among us, how could the artery escape here? I can only suppose that the artery is the most limber and elastic, and (being a tube) the most compressible of any part in the limb, and that by its yielding to the push of the cellular membrane before the ball, it escapes the degree of attrition which would destroy life in the coats.

Let my reader, however, beware of the injunction in Mr. Hunter's work, p. 525, regarding the sloughing of arteries and secondary hæmorrhagy. I neither object to the fact nor to the reasoning upon it. I only offer these observations as some relief to the anxiety from such a sentence as this:—"The patient lying easy even for ten days, is no security that in the end he shall not bleed to death." When large sloughs hang from the wound, when bags of matter form among the muscles, &c. in the tract of cellular membrane which accompanies the arteries, (a very frequent consequence of gun-shot, especially if the bone is injured,) we must not consider all this extensive loss of substance as the effect of the contusion of the ball, nor the bursting out of blood as the consequence of the ball brushing by the artery. This case is in no respect different from the secondary hemorrhagy after amputation, when there is a sloughing stump.

I acknowledge that these introductory observations to the following description of the manner of taking up the arteries, when cut in wounds, have been extended to a great comparative length; but

but I hope my reader will make the best use of the error, if it be one, and learn to consider it as a much more difficult thing to determine on the propriety of an operation than to do it.

Let me add one thing more, that in describing the manner of cutting to disclose some of the arteries, I intend rather that my reader may have a note of their exact place, and that he may be able to avoid them in operation, than that I consider it probable he shall have occasion to do the operation as described.

TO CUT FOR THE CAROTID ARTERY.

To cut down for the trunk of the carotid artery, I would turn the chin towards the same side, and then make an incision three inches in length along the anterior edge of the sterno-mastoideus muscle. In doing this, the firm cellular membrane, and some of the anterior fibres of the platysma myoides, must be cut. Having fairly laid bare the edge of the mastoideus, we ought to do no more with the edge of the knife; we ought then to hold aside the mastoideus, and, with the fingers and handle of the knife, dig down to the artery, and free it from the vein and par vagum, (as we would free the vas deferens from the rest of the spermatic cord in the operation of cutting off the testicle.)

We find a small muscle, the omo-hyoideus passing obliquely over the artery, about an inch and a half from the head of the clavicle. The great internal

 jugular

jugular vein is close on the outside of the artery, the par vagum betwixt the vessels, the sympathetic nerve beneath, and close upon the vertebræ. If a small nerve be observed running above the artery, it is the descendens noni.

If vessels bleed in making this incision, they are muscular branches of the thyroid artery.

TO CUT FOR THE EXTERNAL CAROTID ARTERY.

I do not in this place speak of the propriety of taking up this artery. I describe the exact situation of it, first, to shew the possibility of putting a ligature round it; and in the second place, to give such an accurate description of its place, as may enable the surgeon to avoid it.

Cut through the skin from the lobe of the ear towards the point of the os hyoides: dissect through the platisma myoides; you will then come to the digastric muscle; dissect a little along its upper edge and there you find the stylo-hyoideus muscle; upon forcing this last muscle a little downward you will discover the continued trunk of the external carotid artery.

OF THE THYROID ARTERIES.

The inferior thyroid artery lies in a situation not to be tied. Where it is on the outer side of the carotid artery, it lies near the side of the vertebræ, fully five fingers breadth from the clavicle. It might be sought for directly under the

the omo-hyoideus, and betwixt the carotid and the anterior edge of the scaleni. But in the living body it cannot be taken up there. In cutting for it, I cut the sympathetic and the phrenic nerve.

It may be proposed, previous to the attempt of extirpating the thyroid gland, to tie the four arteries which supply it. We cannot reach the inferior thyroid artery before it has passed under the carotid: the only possible way is, as I have just said, to lift up the inferior lobe of the tumor, separating the carotid from it; then we shall find the inferior thyroid artery rising in two branches, to be distributed to the gland. It would appear as if these branches were descending from the carotid, by the acute turn they take downwards from their highest point on the neck.

I hope none of my young friends will ever enter on the extirpation of the thyroid gland from any thing I have said here.

TO FIND THE LINGUAL ARTERY.

The lingual artery makes its great curve (being tortuous) immediately above the great horn of the os hyoides; it then passes under the mylo-hyoideus muscle. Were it ever necessary to cut upon it here, let the extreme point of the os hyoides be the mark; for it turns just above it to pass under the mylo-hyoideus. Cut through the platisma myoides, raise the lower edge of the sub-maxillary gland, feel the extremity of the os hyoides.

Take

Take care of the nerve which you see lying near it: it is the ninth pair, and is betwixt the artery and the tendon of the digastricus or biventer maxilæ.

OF THE EXACT PLACE OF THE OCCIPITAL ARTERY.

THE occipital artery is found immediately under the mastoid process; from under the insertion of the mastoid muscle it runs backwards, on a level with the tip of the ear, under the insertion of the trapezius, and, of course, under the superior transverse ridge of the occipital bone. On the side of the neck, the internal jugular vein is immediately under it; it is under the origin of the digastricus.

TO FIND THE SUBCLAVIAN ARTERY.

THE patient is seated *; and the assistant at his back, with his fingers in the cavity behind the clavicle, pushes forward and downward to compress the artery.

To cut for the subclavian artery, I begin the incision an inch from the inner head of the clavicle; I carry it in a direction slightly deviating from the line parallel with the clavicle, towards the acromion scapulæ. My second incision cuts the fibres of the pectoralis major, where they arise from the clavicle; I here come upon a thick bed of cellular membrane, which being lifted, I find the great subclavian vein,

* See operation of amputation at the shoulder joint.

with

with the cephalic vein joining it; under this vein, and a little further backward (more under the clavicle,) I feel the subclavian artery, and can put a ligature around it; the nerves are behind the artery.

N. B. If there should be a dangerous hemorrhagy from the axilla, and the patient big and muscular, and the compression ineffectual; by making such an incision as is here described, (or perhaps somewhat less extensive, but sufficient to allow the finger to go through the clavicular portion of the pectoralis muscle,) we shall be enabled, with much ease, to put the point of the finger on the artery, and press it against the rib, until the vessel in the axilla be secured.

THE LOWER PART OF THE AXILLARY ARTERY, OR BEGINNING OF THE HUMERAL ARTERY.

If we have to turn up the edge of the pectoralis major, to tie the axillary artery, we find the artery on the inside of the coraco-brachialis; the external cutaneous nerve is on the outside of the artery, the radial nerve on the inside, and the muscular spiral below it; the vein is betwixt the artery and the muscle; higher up in the axilla the artery is involved in the plexus.

I need not repeat, that in these descriptions of the exact seat of the arteries I intend that they should enable the surgeon to avoid them, as well as to cut upon them and take them up. By attending to the above circumstances I cut a ragged ball out

out from behind the artery and nerves without hurting either.

THE HUMERAL ARTERY LOWER IN THE ARM.

The humeral artery does not run a perfectly straight course down the arm. When the subject is laid on its back, the arm by the side, and the palm of the hand flat upon the table, if we push a point horizontally under the arm-bone, one hand's breadth from its head, the artery escapes. When in the same horizonal direction, two hands' breadth from the head of the bone, the artery is transfixed. Lower down the arm, the artery again rises towards the fore part of the humerus.

To find the humeral artery before passing over the elbow joint, we make the patient bend the other arm against a force, to shew the expansion of the biceps. Having marked its place, we refer it to the wounded arm, and make an incision along the inner edge of the biceps, or rather, we might say, just where it begins to throw off its tendinous expansion, that is, two fingers' breadth from the inner condyle of the os humeri, and carry the knife upwards. We do not immediately find the artery, but the radial nerve covering the artery; laying the nerve aside, we find the artery lying betwixt its two venæ comites.

THE RADIAL ARTERY.

To find the radial artery in its course one third down the arm,—cut on the inner edge of the *supi-*

nator longus, first through the thin fascia—then lift the edge of the muscle, and under a second fascia you find the radial artery, passing over the tendon of the *pronator teres.*

To take up the radial artery on the wrist, we cut a quarter of an inch from the radial edge of the *Flexor Carpi Radialis.* A fascia covers the artery here. A small nerve (from the *external cutaneous*) runs above the fascia. N. B. The insertion of the Supinator Radii Longus is on the outside, but flat, giving no mark outwardly. The *Extensor Primi Internodii Policis* comes obliquely over the head of the Radius, and the insertion of the Supinator.

To cut for the Radial Artery, when it has passed from the fore part of the wrist, we carry the knife on the outside of the insertion of the *Extensor Primi Internodii Policis*, and the inside of the *Extensor Tertii Internodii Policis.* Betwixt these tendons the artery lies very deep, and over it the extreme branch of the *Muscular Spiral Nerve.* We find the artery going close upon the notch, betwixt the os scaphoides and the trapezium.

THE ULNAR ARTERY.

Ulnar Artery. 1. In the middle of the fore arm the artery lies under the fascia, and under the margin of the *Flexor Ulnaris* and *Flexor Digitorum Sublimis*, rather more under the margin of the last. To tie the artery, we cut down betwixt these muscles. The *Ulnar Nerve* lies on the ulnar edge of the artery.

2. To

2. To cut for the ulnar artery near the wrist. We carry the knife upon the radial side of the *Flexor Carpi Ulnaris*; we raise the fascia, which binds down the tendon; but still we have another layer of the fascia, under which the artery and its *Venæ Comites* lie. The *nerve* is lying more under the tendon of the ulnaris than the artery, but close upon the artery.

TO TAKE UP THE FEMORAL ARTERY LOW IN THE THIGH.

See the operation for Popliteal Aneurism, Vol. I. page 335.

TO FIND THE GLUTEAL ARTERY.

To strike upon the gluteal artery, we cut in the direction of the fibres of the gluteus maximus, beginning about two fingers' breadth beneath the posterior spine of the ilium; we cut through the gluteus maximus and medius just upon the lower edge of the ilium; we find the trunk of this artery rising to mount upon the back of the ilium; we must observe too, that considerable branches are carried outwards through the muscle, into which we must cut to arrive at the seat of the trunk.

In case of a wound of this artery and the formation of a false aneurism, the surgeon has to push his finger decidedly down upon the trunk of the artery, as it turns over the notch of the ilium, and compressing it there he may gain time to clear away the blood.

THE ISCHIATIC ARTERY.

To hit upon the ischiatic artery as it comes out from the pelvis, begin the incision by the side of the sacrum, three fingers' breadth from the posterior spinous process of the ilium; and carry it down in the length of the fibres of the gluteus maximus, to the outside of the tuberosity of the ischium. Even in a thin man, the artery lies two inches deep. Now, pushing in the finger as if under the sacrum, we there feel the acute edge of the sacro-sciatic ligament; on the lower margin of the sacro-sciatic hole, (which is distinctly felt with the finger amongst the looser parts,) the artery is felt crossing the ligament obliquely; near it, upon its outer side, are some lesser nerves; the great sciatic nerve is removed an inch from it.

TO CUT FOR THE ANTERIOR TIBIAL ARTERY, HIGH IN THE FORE PART OF THE LEG.

The anterior tibial artery comes through betwixt the bones, one inch below the projection of the knob of the fibula. To find it we cut through the strong fascia which is extended betwixt the heads of the tibia and fibula; we then cut by the edge of the *peroneus longus*, and follow the partition fascia which is betwixt this muscle and the head of the *Extensor Digitorum Communis*. This partition carries us deep: we find the artery lying on the interosseous ligament.

Wherever we have to pierce a fascia for such a purpose as this, it must be cut very freely.

TO CUT FOR THE ANTERIOR TIBIAL ARTERY, LOWER IN THE LEG.

To cut upon the anterior tibial artery about the middle of the leg, I take the spine of the tibia for my mark. I should cut through the strong fascia at such a distance from the ridge of the tibia, as to be able to carry my knife between the tibialis anticus and Extensor Policis Longus.

To cut upon the artery as it passes over the lower end of the tibia to go forward upon the foot, we make our incision between the projecting tendons of the Extensor Longus Policis and Communis Digitorum.

TO CUT FOR THE FIBULAR ARTERY.

It seems a shocking alternative to be obliged to saw out the fibula, in order to tie this artery. I recommend that this should never be performed.

To find this artery two hands' breadth from the heel, cut betwixt the Gastrocnemius and the Peroneus Longus, i. e. on the outside of the Gastrocnemius, where it is becoming tendinous; turn up the edge of the tendon; you then find the *Flexor Policis Magnus* covered with its sheath. If you seek for the Fibular Artery, by going deep into the leg without piercing this fascia or sheath, you find the *Tibial Nerve*, and may come on the *Tibial Artery*. To find the Fibular, then, we cut down by the side of the bone (fibula) and raise the fibrous origins of the *Flexor Policis.* We then find the artery by the

acute edge of the bone, lying on the interosseous ligament, accompanied only by its Venæ Comites.

TO CUT FOR THE POSTERIOR TIBIAL ARTERY.

The Posterior Tibial Artery. For complicated wounds in the sole of the foot, this artery may require to be taken up behind the ankle joint, and before it pierces under the abductor policis pedis. We shall be directed to the exact place, by observing the lowest projecting part of the tibia. The tendons, which run close upon this tuberosity of the bone, are the Tibialis Posticus, and Flexor Communis; the first lies so closely braced to the bone in its particular sheath, that it will not be observed; the artery runs a little nearer the heel than the tendon of the Flexor Communis; a fascia braces down the artery; the nerve is under the artery.

SECTION XVII.

OF GUN-SHOT WOUNDS.

IT is too common an opinion with surgeons in domestic practice, and in hospitals here at home, that there is nothing peculiar in gun-shot wounds. I have often heard it said that a gun-shot wound is but a bruised wound, and that when the slough is discharged it is but a common wound. It is mortifying to the pride of theory to see how often it is humbled before the conviction of practice: even the scenes I have witnessed, and the cases I have had

The above sketch represents the fungus cerebri from gun-shot fractures.

had under my care, have proved to me that the books we possess upon the subject of field-practice do not even hint at the nature of the difficulties the surgeon has to encounter there. In the nature and in the progress of gun-shot wounds, there is much to be observed which never is to be seen in domestic practice. Not only is the surgeon placed in a very peculiar and trying situation, where his knowledge must be ready, and his judgment clear, and his practice decisive, but his opinion on the cases of those wounded in battle is to be formed from circumstances widely different from those which guide the domestic surgeon in his practice.

As my object in the few observations I have to make is not to fall into the old question of the peculiarity of the wound by fire-arms, but rather to place before my reader the difficulties of the service, I shall first enumerate the principal varieties of wounds brought into the cockpit of a man-of-war during a sea-fight, with something of the detail of the preparations.

The surgeon of a ship, before he quits the port, ought to provide himself with a small chest of bandages and dressings; callico-rollers, tow, lint, linen, and plaster, also sponges and compresses, and prepared ligatures. There ought also to be deposited in this chest a number of common tourniquets besides those kept in the other cases of instruments. This chest should be kept reserved for the day of action, and it ought to be in such order that when opened during an engagement, all that it contains should at once be under the eye; so that any thing may

may be taken out without disordering the arrangement.

When the physician of a fleet goes aboard to examine the state of his department, his first care is to look to the surgeon's instruments; because they are at once so essential in practice, and they inform him of the surgeon's habits of order and attention. The occasion for their use comes so suddenly; the cases are of such high magnitude; and the difficulties accumulate so fast during an engagement, that unless all be prepared beforehand, no degree of activity, though united with the greatest imaginable presence of mind, can enable the surgeon to fulfil his duty.

When the drum beats to quarters, the surgeon has to see that the operation table is securely fixed; that there is sufficient supply of candles and lanthorns, and that the assistants know their places. He has to consider also what provision is made for the wounded after they are dressed, and to see that the cots are hung up in the tiers or other safe places. It is now a time of fearful expectation, and there are few situations in which a man more requires coolness of reflection. It is now that he feels how much the nature of the wounds of those who may be brought down to him ought to have occupied his mind in previous study.

Almost every kind of wound to which men are exposed in the field of battle, comes also under the care of the navy-surgeon, together with a greater proportion of wounds contused and lacerated, from splinters and bolts torn from the sides of the ship, and

and the carriages of the cannon: besides, there the surgeon must expect men to be brought down to him extensively burned by the explosion of gunpowder, and for these he ought to have proper dressings provided.

When great shot enter through the sides of a ship, the mischief they do is in proportion to their diminished velocity. For when their course is with great velocity, they pass clear through and destroy only what they touch; but when they enter with a lessened force, they tear up the ship's side throwing the splinters around, and causing splinter wounds.

During the American war, and in former times when the hostile fleets of great Britain and France engaged at a distance, splinter wounds were more frequent than in our late engagements. In the war which has just terminated, and in the former, it has been the rule to approach within musket-shot of the enemy. A severe loss falls in consequence on the men in the poop, quarter deck, and forecastle by musket and cannister shot, and grape shot. Indeed more men are killed and wounded in proportion to their numbers in these exposed situations, than in the other parts of the ship. Even in the lower deck during a close action, more injury is done by shot than by splinters *. It sometimes happens, though much more rarely in our ships than in foreign service, that a gun bursts. Then there is

* In the action of Trafalgar, the Revenge lost twenty-five men killed, and fifty wounded: of those eight men only were killed in the lower deck, and these by one shot.

a com-

a complication of wounds: limbs are half torn off; the flesh lacerated; perhaps the cavities opened: irregular pieces of iron are driven deep and many are scorched. In expeditions with boats, if a surgeon or mate be sent, he can only be required to stop the blood from recent wounds, to use the compress and roller, or the tourniquet. In boarding, the wounds must be of the most dangerous kind, being with the pike and cutlass, fractured sculls, deep flesh wounds where the great vessels are cut, and stabs penetrating the great cavities.

Let us now turn our attention to *the circumstances in which the army-surgeon finds himself.* If the navy-surgeon has difficulties to encounter, from having many thrown upon him at once hurriedly, the army-surgeon requires to have even still more resources in himself. When his patients are thrown in crowds into churches and convents, or lie in the streets of a town, as after a great engagement, or are hurried off in the bustle and confusion of a retreat, he has no opportunity of applying the resources of his art; but ought not this to have been foreseen? shall it be again said, that this is no time for thinking of individual cases or of operations? It is the very precise time in which the prompt determination of the surgeon is of the first consequence, and now also ought the amputations to be performed on the patients whose circumstances require it. It becomes a duty of the first importance to secure, on a large scale, the supply of those things which are necessary to the immediat safety. It is the surgeon's duty to see that there be provided, and properly

properly supplied, compresses, and rollers, and lint, and linen cloth, to be kept wet on the wounded limbs. But it is above all necessary, that he shall previously have consulted with those who foresee, or controul the operation of the field, so that he may have prepared a place of temporary retreat, where he may be provided with proper assistants, instruments, and dressings, for the performance of operations. The French surgeons accuse us o deferring our field operations too long, and even of negligence in our naval department where there can be no temptation to defer amputations. But we can both repel this accusation and convey a censure at the same time, by affirming that they are ignorant of what we are doing in England. But, no doubt, better times are coming, when the members of the profession in the two countries will become a mutual assistance to each other; the intercourse has auspiciously commenced.

Often I have been told, when enquiring for facts, "Cases, Sir, (the surgeon has said) how can you expect them, when we are stepping over bodies to see who are beyond help and who are yet alive?" Thus it is that the greatest opportunities are lost, and the extent of the field of observation is the apology for ignorance. Individual cases in detail are not indeed to be expected in such awful circumstances; but there are occasions from which the most important lessons may be drawn, and observations made on a great scale, of the most signal use to science and the service — where the incidents of an age of ordinary practice are brought

at once under the eye. Especially in the subsequent hospital management of these cases, the most inestimable opportunities are afforded for the improvement of the profession. Cases of the same kind are brought together, occurring in circumstances nearly alike, and exhibiting the great features and peculiar character of wounds, while lesser particulars, that in a single case are apt to be mistaken for necessary adjuncts, come on the general view of these cases to appear in their true characters of incidental circumstances which no longer can distract the judgment.

In order to secure to the surgeon that information which may be drawn from an extensive field of observation, and to facilitate his observations, it is necessary that the wounded be classed according to the nature and severity of their wounds. This will make the business of the day easy to the inferior officers, and enable the inspectors at once to see what cases are desperate, what require consultation, and how many need merely to be kept in free air, and on low diet, with wet linen on their wounds. Every thing that facilitates business in such a scene is of consequence to the wounded; because time and consideration can then be given to such as require it; and whatever brings forward into notice the cases of difficulty, is of the first consequence both to the service and to the improvement of the profession.

When the surgeon comes to determine on the cases under his care, it is distracting to pass from a man with a wound in the belly to one with a

shattered

shattered bone; from a case of wounded lungs to the question of amputation; here a gun-shot fracture of the skull, and the next a ball lodged in the knee joint. If, instead of this, the cases are properly arranged, the prevailing symptoms of danger press forward strongly on the attention, and one case illustrates and clears the obscurities in another. Where there are many cases of fracture of the skull, or of bullets through the head, the prevailing symptoms of danger make the most forcible impression on the surgeon's mind, where these cases are classed together. First a man begins to be oppressed, and to have twitching of the muscles of the face; he then falls into terrible convulsions and muttering delirium. In the mean time another is attacked with similar symptoms, and both are seen struggling in convulsions; a third is attacked, and the first finds relief in the insensibility which precedes death. — Thus the occurrence of threatening symptoms in one patient becomes a forewarning for the benefit of others, urging the necessity of a certain line of practice. The suffering or the death of one is thus the safety of the rest, as when the leading ship takes the ground, and becomes a beacon to steer the others by. When several men have been struck with musket-balls which have lodged in the great bones, the wounds being received in the same day, and there being a general resemblance in them, the violence of inflammation comes at the same time and with a prevailing character, and there is great swelling of the limb, and abscesses in parts of the

limb

limb remote from where the ball is lodged. The effect of the injury to a bone, and the lodgement of the ball, is evident to observation. Whereas, witnessing a single or isolated case, the surgeon might mistake the abscess forming in the calf of the leg from a wound of the femur, as proceeding from an accidental injury there.—I must add that the army-surgeon seeking to improve himself requires not to interfere with any general arrangement; he can make the classification in his own note book, and in it see the general results.

OF A WOUND BY A MUSKET-BALL.

When a man is mortally wounded he leaps from the ranks, or from the saddle, before he falls.— Often a man is wounded without knowing it, until his fellow [illegible] the blood trickling from him, but this is in the heat of fight.— There is in severe wounds an alarm, oppression, and faintness, and the contents of the stomach are discharged; and often a confusion of mind, coldness, and insensibility attends them, or there come rigors, nausea, and want of sensation in the extremities. If insensibility continues during the necessary operations, it is an unfavourable sign. This is because the injury has borne on the constitutional powers; and so a burning drought, restlessness, and inquietude, after great wounds of every description, are symptoms of danger.

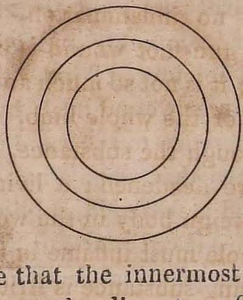
1. The transit of a bullet through a limb is made with a rapidity so foreign to the usual course of sensation, that no pain or even very distinct

distinct idea is conveyed. 2. The blood does not flow so freely in gun-shot wounds as it does in other wounds, because the vessels and nerves are benumbed and paralysed by the pressure of the ball in its passage, and the small vessels which would bleed, were they open, are closed by the bruised parts; for what part is touched by the bullet is not carried away, but left for a time attached to the living parts. 3. The appearance of a gun-shot wound is much like that of a wound made in the dead body, only that there is around the gun-shot wound a slight blackness of the skin, and the blackened cellular substance is seen within the wound. 4. In surgery we may observe that inflammation and pain go together; and, as in gun-shot wound, there has been little pain, so for some time there will be no inflammation. 5. But the inflammation of gun-shot wound is by and bye deep and extensive; it is not so much an inflammation of the wound as of the whole limb. There is a passage made through the substance, and the sides of this passage are deadened: a living part become dead is as a foreign body in the wound, and therefore the shot hole must inflame in its whole extent, because the living substance is irritated by the contact of the dead matter. The inflammation is in a great measure the act of the living surface ulcerating and separating from the dead slough. The dead matter comes out like a piece of dirty rag, or chewed paper. We speak of the slough discharging itself, and of the separation of the slough, but the dead matter is passive; its discharge is owing

to the ulceration, and the weeping secretion of the living part.

Let us take this in another light; — a bullet being an obtuse body forced through the flesh, and yet taking none of the substance away, the parts are in its rapid passage pushed aside, but so bruised that their life is destroyed. Thus the suppuration of the wound, and the separation of the dead matter, must be counted as a first step to recovery:

6. But the inflammation of a gun-shot wound is not caused merely by the circumstance of dead matter being in the tract of the wound, the ball has also injured the parts which remain alive, and the surrounding living tube has received the shock and pressure of the parts deadened by the immediate contact of the ball in its passage.



I shall suppose that the innermost of these circles corresponds to the diameter of the ball, the substance occupying this inmost circle is forced aside, and is condensed into the space betwixt the internal and second circle, and consequently it is mashed and destroyed. It is at the same time evident, that the substance occupying the space betwixt the second and third circle must, by the recoil

recoil of the deadened substance, be displaced with a force of percussion proportioned to the velocity of the ball. This portion of the substance being benumbed, or rendered paralytic, requires some time to recover its vital powers, but when it does react and inflame, the inflammation is in degree corresponding with the violence of the injury which has been sustained. These considerations will explain the following circumstances.

As it is the velocity of the ball which produces the peculiar character of gun-shot wound, and as the force of the ball must be somewhat spent in its passage, from the resistance it meets with, the part at which the ball makes its exit will be less distinguishable from the nature of a common wound than that at which it entered. Accordingly the orifice at which the ball passes out assumes the inflammatory action more quickly and heals sooner than that at which it entered; indeed instances occur where the counter wound heals by the first intention. By reference to the same principles we see how it happens that when a ball strikes obliquely on a bone, and is flattened, it glides outward, and being now sharp it cuts the skin. The obtuseness of the ball being a principal cause of the peculiarity in the wound it makes, when it has lost its form, the wound it makes loses also, in considerable degree, the character peculiar to bullet wounds.—In examining gun-shot wounds even twelve or fifteen days after they have been received, I have been able to distinguish in what direction the ball went. In the early days the wound at which the ball

ball entered is the smaller, afterwards it becomes much the larger. Where the ball entered there is a small black hole; where it made its exit the opening is more torn and larger; — this is at first: the reverse exactly is the case afterwards, for the entrance of the ball is a large wound, at which the skin is wasted, and where much slough hangs out; while the orifice in the opposite side of the limb is in a state of healing, or at least contracting. In plate I. I have sketched two wounds on one body, I saw the two patients at the same time, and thought I might take the liberty of transferring the wound of one of them to the other in representation. The ball entered under the integuments of the belly, and it being ten or twelve days after the wound was received, I knew A to be the entrance of the ball, and B to be its exit, because the hole A being choaked with slough, implied that there the ball had more velocity, and produced a more violent attrition. — The lower wound was through both testicles, and C was the entrance of the ball, as I knew from the same circumstances, viz. the greater inflammation, and the greater mass of slough which hung from the wound. *

In the case of John Roe, which is given under the head of wounded arteries, there was, I trust, a rare example, proving the nature of gun-shot wounds, in respect to the death of the surface exposed, and shewing that it cannot be brought to unite.

* There was some talk of amputating the testicles: but wherefore? I have learnt, that this man has since had a child.

unite. A grape-shot, after passing through the fore arm, entered under the integuments of the belly, and ran betwixt them and the muscles. The wound was directly over the scrobiculus cordis, and from the looseness of the part, and the ball being in some degree spent, the wound was large and ragged, so that the surgeon's hand being held conically, could be thrust into the orifice at which the ball entered, and the finger could be brought out at the counter opening. The surgeon sewed this wound with three great stiches of the needle. But there was very little pain in the operation, a sure sign that it would not succeed. The edges of the wound being dead, it was necessary they should slough. Eight days after the battle, it was found necessary to cut the stiches, which gave great and immediate relief.

OF THE COURSE OF A BULLET, AND OF THE PROBABLE PLACE OF LODGEMENT.

In a short time after the infliction of the wound, if the ball has taken a course under the skin, we may perceive the course it has taken by a red stripe on the skin, like a blush of the cutaneous vessels. By attending to this circumstance, I have discovered the ball in a remote and unexpected place. The passage which a ball makes is very seldom direct; a very slight degree of lateral resistance changes its course. The most frequent place of its lodgement is just under the integuments of the opposite side of the limb to where it entered.

entered. For we find that a ball pierces the resisting solids more easily than it does the elastic skin. For example, a ball after breaking the bone, and passing clear through the muscular substance, being met by the elastic resistance of the skin, has its force subdued, and it remains under the skin, where a touch with a lancet will give it exit.

If a ball strikes perpendicular to the surface of a spongy bone, it will enter and lodge in the bone, as in the vertebræ, or in the head of the thigh-bone. In fig. 1. plate II., the ball A is seen sunk into the condyle of the femur; but this situation of the ball is not so frequent as that exhibited in the second figure, where A is the hole where the ball entered, and B is the ball itself, lodged not in the bone properly, but on the posterior surface, where, although it had force to penetrate the bone, had not force to overcome the resistance of the elastic ligament. This is not a solitary instance: in the fourth figure of the succeeding plate, the ball has passed through the body of the vertebræ, but has not been able to burst up the posterior longitudinal ligament. I have in my collection, a ball lodged in the hip joint, where the ball has broken and penetrated the neck of the thigh-bone, but has not had force to pass out of the capsular ligament. A young gentleman consulted me within these few days, with a ball in his foot; the ball had penetrated the tarsus, but was prevented making its exit by the plantar aponeurosis. The Baron Driesen, who is here under my care, has received a ball which has penetrated

 the

the inner condyle of the thigh, but lies arrested at the root of the crucial ligaments, where they take attachment to the notch of the thigh-bone B. An officer came to me who had received a ball in the back of the elbow joint; it penetrated the olecranon and humerus, and lay under the tendon of the brachialis internus. My reader will perceive that this lodgement of the ball, which has penetrated a bone, is accounted for on the same principle with that of the ball which has traversed the limb, and lodges just under the skin of the opposite side: elasticity, possessed by the skin in the one instance, and the ligaments in the other, is a power more capable of subduing the force of the ball than the more solid resistance of either the muscle or the bone.*

If a ball strikes a hard bone with a force not sufficient to break it, the ball will be flattened, and, slanting off, will cut into the soft parts in a new direction. A ball hitting a bone is more apt to splinter it when its velocity is diminished. The

* It is the same principle which explains the circumstance so frequently occurring of the ball being found within the trowsers, and that again explains how it happens, that a ball penetrates the urinary bladder, from whence it is unable to escape through the yielding coats. I saw some years ago a very singular exhibition, which is to be accounted for in the same way; a soldier received a musket-ball in the globe of the eye, where it remained: it was in that situation too valuable for him to consent to have it extracted. A gentleman received a bullet in the side, it coursed round the belly betwixt the abdominal muscles until it was stopt in the sheath of the rectus, and there I have let it remain, as it gives no pain, and is not likely to be attended with future danger.

difference

difference of effect proceeding from the greater or lesser velocity, is well exemplified by a drawing of my brother's, I have before me. The anterior plate of the frontal sinus was pierced by a pistol ball, but the ball could not pass through the second plate of bone, but was flattened against it. In this case, it was necessary to apply the trephine before the lead could be extracted. I could give many instances to prove that when a leaden ball has struck a bone, we have not in our search to expect to feel a ball, but an irregular piece of lead. Sometimes the ball is cut in two, but oftener it is so flattened as to resemble half a ball. When a ball is turned off from the surface of a bone, it generally takes an oblique course among the cellular substances, and runs a long way under the skin. I have been informed, that a pistol bullet entered the right fore-arm of a duellist, and was stopt by the radius of the left arm, the arm being bent:—that a man being shot in the outside of the right thigh, the ball made its exit on the corresponding part of the left. This latter instance I can the more readily believe, having seen a wound in the middle of the left thigh, and the ball cut out upon the outside of the right hip: if it had met the trochanter it would have been directed down the right thigh. In the accompanying sketches there is the representation of two soldiers, who were wounded at Corunna, where the balls entered at the same part of the back in both, viz. betwixt the spine and the bone of the scapula. In the one case the ball

 went

went through the chest, and made its exit above the right breast; the other came over the shoulder, and lay under the skin of the fore part of the breast, where it was cut out. As they lay in the ward together, I was struck with the contrast they offered.

In the specimens of balls lodging in bones, or which have passed through them, which from time to time I have picked up, none of them are changed in figure. It does not absolutely follow, that a ball which has entered a bone shall retain its spherical form, yet it does so for the most part; but if it has struck a bone, and glided off among the soft parts, it will be found flat or irregular.

If, however, a ball strikes and splinters a bone, and then lodges in the soft parts, there is a probability that the lead will be quite irregular and ragged. For example, if a ball has passed through the wrist, or fractured the radius, and has passed out and entered again into the side, or arm, or axilla, we shall probably find a piece of lead no longer retaining the figure of a ball. In such circumstances I have found a piece of lead as irregular as if it had been melted and cast into water.

In searching for a ball, it may be thought very easy to distinguish with the probe betwixt the surface of the lead and the bone, but it is not always so, and I have been deceived, and have seen experienced military surgeons tugging on what proved to be a portion of the bone. When it is important to discover, whether what we feel be the

the ball, or a portion of bone, we must bore the finger into the wound. A circumstance particularly apt to deceive us in an old wound, is a concretion which forms on the ball, and which gives it more the sensation of a bone.

A ball may sometimes be felt through the skin as if it lay quite superficially, and yet it shall be deep. I have heard a surgeon, while he was cutting for a ball, declare, that he believed the deeper he cut, the more substance was betwixt him and the ball. — An abscess will sometimes show the place of the ball, as in plate VI., where an abscess on the breast declared the place of the ball.

A circumstance of much importance, and leading to the knowledge of the place of the ball, is the consideration of the nature of the sensations, and the course of the nerves; and when the operator is about to make an incision for the extraction of the ball, let him observe well how it has entered, and how it lies in reference to the vessels and nerves. A gentleman requested me to be present while he cut out a ball from a young man's arm: the ball seemed to lie superficially, and immediately under the integuments of the inside of the arm. He commenced his operation very inconsiderately, and without reflecting on the course the ball had taken. I had taken a sketch of the arm, plate VII. fig. 2. I observed, that the ball had entered on the fore-part of the arm (where the cicatrix of the wound was), and that it must have struck the humerus. I also observed, that on pressing the integuments over the ball, the patient felt a numb-

ness all down his arm in the course of the radial or median nerve. These circumstances made me say, when the surgeon took the knife in his hand, that it would be necessary to go round the artery, an expression which he did not fully understand, for he made an incision directly upon the prominent part of the lead (a ball it could no longer be called). The ball did not start forward, as he expected. He made repeated incisions, until I could see the brachial artery beating under the course of his knife. There was now a deep and bloody wound, instead of a mere touch upon the skin as with a lancet, which my friend thought would have sufficed; and now he said, with much good humour, that he believed I knew best about these nerves and arteries, and put the knife into my hand. I dissected for the edge of the biceps muscle, thrust aside that muscle, and cut through the brachialis internus down to the bone, against which the lead was flattened, while a sharp angle stood up on each side of the brachial artery and radial nerve. It was with difficulty that I got out the rough lead from under the artery without tearing the vessel. Had the original incision been persevered in, the brachial artery must have been cut across. Thus my reader may perceive, that we shall sometimes have to follow the ball in its course, to extract it from its seat under the great vessels.

In all his difficulties, the surgeon has still to hold in his recollection the stages and progress of a gun-shot wound as they relate to operation.

When

When the wound is first received, the inflammation and pain has not yet arisen. If the ball can be felt distinctly, it is to be extracted. But we have to remember the difficulty of ascertaining the place of the ball, especially if it be flattened and irregular, as when it has touched a bone. If we can touch it with the finger, there can remain no doubt of the propriety of its being extracted. If it can be felt in the part of the limb opposite to the wound, there can be no doubt of the propriety of making a counter opening for the purpose of extracting it. This opening will quickly heal, and it ought to be allowed to bleed freely. In the operation of extracting the ball, forceps will be less useful than the spoon or lever. The forceps, which are generally made for the extraction of balls, often cannot be used; when a simple lever or spoon, or even the common dressing forceps, are useful. The crane bill forceps is a useful instrument. I have received the forceps used in the French armies, and I think them excellent. They separate so, that of their blades we may form levers: — one part of the handle is of a shape to extract balls from the cavities, and the other has a screw suited to extract cloth from the wound. I have sent these forceps to the principal instrument-makers, so that they may be ordered by my readers.

OF THE INFLAMMATION OF GUN-SHOT WOUNDS.

The ball in its passage has formed a dead case or tube, which lining, as it were, the sensible parts, the contact or lodgement of any foreign body is not felt, nor followed by inflammation. The parts immediately contiguous to the deadened surface are benumbed, and there is a pause as it were in their action before the inflammation rises. This is a time when the surgeon can with most freedom examine the wound; but even now a teazing interference, and frequent probing or incisions, will accelerate the inflammation, and bring it on before there is a disposition to throw off the slough. In like manner when the bone is broken, and pieces are driven among the flesh, the inflammation is not only greater in degree, but rises earlier; the wounds made by the bone, being like common wounds, they inflame rapidly.

With the rising inflammation the wound begins to gleet and discharge, and by and bye, that is about the sixth or seventh day, the suppuration is established,

established, and the slough which plugged the wound protrudes. The dead parts have separated, but they still remain in the wound a source of irritation, while they at the same time obstruct the discharge.

From the seventh to the tenth day the slough (that is, the dead cellular membrane,) hangs from the wound like a piece of dirty lint or chewed paper; and although there be a zone of inflammation around the orifice of the wound, there is still an indolent character in it. Mr. Hunter conceived that gun-shot wounds were first scarified to take away bones and extraneous bodies, and that afterwards scarification was continued when the occasion was forgotten. I believe that the idea of scarifying these wounds arose from the apparent indolence, and the slow progress they make, which surgeons thought would be accelerated by giving passage to the sloughs. However that may be, scarifying wounds will be of little service in removing this cause of delay. Among the soldiers from Spain, I have seen some whose wounds were scored, as if in religious ceremony, but the cuts were healed, while the narrow wounds remained full of slough.

When the discharge is free, the wound by and bye clears itself of the sloughs, and the granulations soon shew themselves. Then the wound retains no character of gun-shot wound, unless its depth and narrowness. But as now its surface is alive and sensible in all its extent, if any piece of cloth or sharp point of bone remain, they keep up

an irritation and gleety discharge, instead of a moderate discharge of good pus.

TREATMENT OF GUN-SHOT WOUNDS OF FLESHY PARTS.

In the treatment of all wounds, we have to combat a natural desire in the attendants of doing something, and an expectation on their parts that the surgeon has an operation to perform. It requires address to compose the patient, and to convince the friends that nothing ought to be done. Certainly there is nothing in the principles of surgery that authorises the scarifying of a wound. The subject has been ably treated by Mr. Hunter; and there are some excellent examples in favour of doing nothing, in a paper by Dr. Jackson, in the London Medical Journal, vol. xi. The cases given by Mr. Hunter and Dr. Jackson, show very fairly the difference between such wounds as were treated according to art, and the wounds in men who skulking in the out-houses and woods were left to nature. The result was uniformly in favour of those who received no assistance. Scarifying gun-shot wounds of fleshy parts is an unnecessary and useless severity; but a simple and consistent practice is not to be at once established. In the paper which I have just referred to, the author says, it is certainly very proper when wounds run under the skin, that they should be laid open in the whole of their length. Now this also is quite improper. In a practical work on gun-shot wounds, published in this country, advice is given to

to cut freely, and not to spare the fleshy bodies of muscles; the fascia, it is said, is by no means to be spared, and aponeurosis must be cut in all directions like the radiated light of the sun! It is well when extravagance of language is added to heighten the absurdity of this doctrine. But in Mr. John Bell's book on wounds *, there is a force both of words and argument, which is more likely to convey an erroneous notion of the necessity of scarifying gun-shot wounds. I shall not give an extract from a book which should be in the hands of every student of surgery, but be satisfied with stating my opinion in direct contradiction to the rule on this point of practice. One obvious remark occurs on the whole of the passage in favour of scarifying gun-shot wounds, — there are too many reasons assigned for the practice. The short objection to them all is, that we cannot dilate a wound which has been made through the substance of the limb: a transverse, or crucial incision of the skin, will not give room for general swelling; and to open the fascia, by inserting the knife into the wound, would not relieve the limb, though the knife was run down three or four inches. If the question relate to the opening the fascia, in order to permit the general swelling to take place, then it becomes a question in anatomy; for if the fascia is to be slit, it is not to be done by *scarifying* the wound, but by cutting the connection of the fascia to the tendons, or bones, or by

* Discourses on the Nature and Cure of Wounds, 8vo. vol. i. p. 191.

laying that membrane largely open. It is the whole limb which swells up, and not merely the parts around the wound, and therefore, although scarifying the wound may somewhat accelerate the inflammation and consequent changes, yet this is not an object to be desired; for why hurry this stage of the cure, which is mild and favourable according to its slowness, while there is danger of disturbing the natural action by premature excitement? The tension and swelling of the limb is best relieved or prevented by reducing the force of the circulation in it, by the application of cloths dipped in spirits and water.

I hope my reader understands that I foresee cases which shall require the fascia to be cut; that what I contend against is the scarification of the wound in common cases, and that when it is necessary to open the wound, I propose to do it largely and in a decided manner; nay I shall presently show that limbs are lost and patients lame for years in consequence of the neglect of *deep incisions*. But under the head of scarification, I must say a few words more pointedly.

In the latest treatise on this subject, it is said, "When however the entrance of a ball which has "penetrated a fascia will be a depending part, the "orifice may as well be somewhat enlarged imme-"diately, in order to afford a more ready escape "that way for the fluids that will be effused. The "dilatation can be extended afterwards if circum-"stances require it. But where the path of a "shot lies only along cellular membrane, immedi-

"ate dilatation may certainly be dispensed with." If this is not bad practice, it is nevertheless useless severity. In these days, when so much more has been seen by my pupils than myself, it would ill become me to boast; but I have seen wounds through the thigh, through the fore-arm, the leg, the wrist, the hand, and in every part of the body without seeing even an apology for scarifying or slitting up the wound; and although I saw the practice both of the navy and army surgeons in these cases, no idea ever occurred of opening the orifices of the wounds. In conclusion, upon this head of my subject, gun-shot wounds do not require scarifications although gun-shot wounds like bayonet wounds, may fall into a state requiring the use of the scalpel to evacuate matter or to take off the increase of tension and pain, which is the consequence of much swelling under the fascia.

GENERAL TREATMENT.

As to what is to be applied to a gun-shot wound, I most commend the practice of the wounded Frenchman, who being left without assistance, put the remnant of a shirt upon the wounded limb and made urine upon it; for indeed we can apply nothing better than a wet cloth. To apply fomentations to the wounded limb, and poultices to the orifice, what is this but to confine and generate heat, and promote a high inflammatory action?

It is a good remark of Mr. Hunter, that bleeding must be had recourse to with great caution where inflam-

inflammation and fever run high, for to reduce the patient in a degree equal to what the action at the time requires will often be reducing him too much for the constitution to bear after the excitement to action has ceased.

If a patient at home and in full blood has received a gun-shot wound, he ought to be reduced by bleeding, and laxatives, and low diet; but if he has been a soldier, has lost his superfluous fat by the fatigues of a campaign, repose and a simple diet will be for him in the place of medical treatment; it will be sufficient that he be covered with cloths wet in vinegar and water, or water and spirits. I have said that on receiving a severe wound, the patient often vomits. In the course of the treatment, the same sympathy continues, and the stomach and bowels are influenced by the state of the wound. It is for this reason that when there is an irritable wound, it is necessary to keep the patient on a strict regimen of soups, and light liquid food, panada, rice, &c. He ought to have by him some mild decoction for drink, and laxatives will be required from time to time during his confinement. When the suppuration is established and becoming profuse and weakening, wine and bark will be required and aromatic confection. If there occur restlessness, threatening delirium, a smart purge followed by an opiate will produce quiet. Now instead of cold applications to the wound, as spirits and solution of sal ammoniac in vinegar, warm spirituous fomentations, and tepid solutions of opium, will be found serviceable. And again, when there

there is an extensive open wound which has suppurated, and the edges of the wound become pale and dry, there is probably an accession of fever, which must be looked to, while warm fomentations ought to be applied to the wounded parts.

When the edges of a large wound fall loose, and a thin sanious discharge comes from it, a more generous diet must be given with bark and wine; at this time stimulating dressings are applied, and over them a warm poultice, with occasional warm spirituous fomentation.

No symptom can be worse than when, from an extensive or deep wound, the discharge is like coffee-grounds; for then there is a failure of the strength, a failure of the life of the parts; the discharge is the resolved coagulum of blood, or the blood flowing from the smaller vessels become putrid in the cavities.

Gun-shot wounds even of the muscular parts and integuments sometimes produce abscess and spurious fistula. Whenever this occurs we must attend in a very particular manner to the state of general health. Confinement or bad air, or the sudden change from scenes of interest and activity to absolute inactivity and repose, have affected the powers of the system: It is thus that I would explain the following circumstance; "the healing process was rapid while we were upon the march; proceeded more slowly when we halted; and was in some degree retrograde when we fixed our stations." In the common soldiers the abuse of spirituous liquors often occasions an unfavourable alteration in the appearance of the wound.

 There

There are frequently two causes combining to make a wound fistulous, and to produce abscess in the neighbouring parts. Thus the Walcheren fever seizing a wounded soldier, the wound presently assumes a new character, and a succession of abscesses form. The wound in a healthy person would not fall into this state, and the fever of itself would not produce abscess. I was requested to see a young officer, whose case was shortly this: on the 10th of August, in driving in the French who had made a sortie from Flushing, he received a musket ball in the belly above the right groin, happily the ball struck his purse, scattering the money, else it must have penetrated into the abdomen. The ball entered under the integuments and came out on the fore part of the belly, a part of the purse was found in the wound.—Until the rising of the inflammation, he had rather an uncomfortable sensation, than pain, and when the wound inflamed he was bent down. On the passage home, his wound seemed in a healing condition, but soon after a swelling rose in his groin, which burst and discharged thin matter; the sore extended rapidly, so that when I came to him, the probe passes from the sore in the groin towards the inside of the thigh, and here an abscess formed anew, which threatened to work down on the back part of the thigh. I introduced the long probe, and cut upon its point behind the head of the gracilis muscle, and, introducing the bistoury at this opening, I exposed the sinus which extended down the thigh; I now put compresses on the sores in the belly and groin, so that the weeping discharge from them

ceased.

ceased. But I could not in this way finally cure my patient, the sores in the thigh still remained open, and this forced my attention more particularly to the state of his health, which my reader will now perceive should have been the first object. I found that he had attacks of fever in the night, which were not to be explained from the circumstance of the wound. I thought, on the contrary, that the fever influenced the wounds, and made them troublesome and slow of healing. It was now that my patient told me that the wound was at one time so well, that he was able to walk about the streets of Middleburg, when suddenly one night he was seized with headach and giddiness, for which he took a soldier's remedy, brandy and a warm blanket; but some days after he had a return of the attack, and the fever increased with sleepless nights, difficulty of breathing, headach, and delirium. I now saw what it was that had retarded the healing of the wounds, and by attention to the fever as well as the wound, the abscesses healed. I mean by this detail to remind my readers of the necessity of attending to the epidemic of the season or the country, for the influence of disease will show itself in the complexion of the wound before it becomes remarkable by its prevalence in the camp.

TREATMENT OF GUN-SHOT FRACTURES.

We enter on a subject which is very important and difficult, and even of some delicacy. Every young

young surgeon, when he finds himself in the field, expresses wonder that he so poorly conceived the nature of gun-shot wounds from reading and the instruction of his teachers; and he adds, what can a lecture in a London theatre teach of this? When the same gentleman returns to us familiar with the horrors of the scene he has witnessed, and proud of the dangers and difficulties he has passed, he feels the subject his own, and an attempt like this, perhaps an encroachment.

But when with every sentiment of respect for practical knowledge thus honourably acquired, we here at home seek to profit by the knowledge of the military surgeon, we find it withheld, and that there is nothing written by them upon the subject. Their apology is, that a man must see and not read. I know very well, that a man will neither learn anatomy nor surgery by reading: but, on the other hand I affirm, that, without reading, the mind of the young surgeon, amidst the fairest opportunities, shows only a little short-lived curiosity during the novelty of the scene, be it the dissecting-room, the hospital, or the field, which soon relaxes, and leaves him inert and indifferent.

One may indeed augur, that he who shows no desire to know the sentiments of those who have preceded him, in a profession so interesting as ours, will have the same heaviness of mind, and show the same indifference when occasions of personal observation offer. I do not recollect to have learned much of gun-shot wounds before seeing them; but by much reading on the subject,

I was

I was prepared with many questions; by long trying to form an idea of their peculiar character, I was prepared to seize with avidity every opportunity, and to observe with attention every change, which I would not have noticed, or would have considered trivial, had I not previously strained to comprehend them by reading. To prepare my reader for observation, when occasions present themselves, is my humble endeavour here; to endeavour to place the subject in its true colours, however faint they may appear, and to try to put the questions of difficulty into such shape, that when the cases do occur, he may be the better prepared to observe and arrange, that his attention may be more intently fixed, and the progress to judgment somewhat accelerated.

Nothing is more apt to deceive than the feeling of bones shattered by gun-shot. We touch a splinter with the point of the finger, or feel it loose to the probe; but if we attempt to draw it away with strong forceps, we find, in all probability, that there has been a splitting up of the bone, and that we have got hold of a very principal part. Even when loose, these pieces are found to require extensive incisions to extract them, or the parts are torn as the pieces of bone are drawn forth. I question very much the propriety of tearing away even lesser pieces, when they adhere firmly.

The surface of a bone may be struck by a ball so that the ball is flattened on it, and yet no exfoliation of the bone takes place. I cut out a

 ball

ball from the arm seven months after it had struck the humerus, and although it was flattened on the bone, the bone was not injured. I have seen the head of the humerus struck by a ball, which ball I found in the muscles of the back, as if divided, and yet no exfoliation took place. When the surface of a skull is hit by a ball, there is undoubtedly great danger, but still nothing is to be done in the way of operation; the skull will often escape unhurt, having suffered neither contusion, nor such injury of its surface as to make it exfoliate. My pupils have related many cases to me where they have seen the skull struck by balls without a bad symptom; but lately, I have myself seen three cases of this kind, in one of which the ball was flattened, and passed two inches under the scalp, and yet there was no injury to the skull. But where the danger is so imminent; and where, if symptoms of an affection of the brain be allowed to commence, it is so seldom in our power to stop the progress of suppuration: it is of the utmost consequence to watch, and keep the patient low.

There is a considerable difference of character between the gun-shot fracture of the cranium and the fracture from a bludgeon, or from the head striking the ground; the fissures do not in the former case run so extensively from the shattered center; the injury is more local; the fractured pieces are smaller, and more numerous; often comminuted. In taking away these pieces, the trephine will seldom be necessary; yet let me here

here guard my reader against forcibly pulling away the pieces of the broken skull, for if he tear the dura mater, a new and more dangerous injury is committed.

When a ball strikes the cylindrical and middle part of a bone, it will break it into many pieces; but if it strikes the head of a bone, it will enter into it. If, in putting the finger into a shot-hole, where the ball has struck the center of the bone, many bruised pieces are found, — if the ball has not merely hit the bone and struck off splinters, but has passed through its substance, then the case becomes more grave and important. The suppuration not only takes place amongst the soft parts, but in the center and medulla of the bone; a bad discharge comes from within the bone; the shaft of the bone dies, and a kind of imperfect and irregular necrosis is formed. The old bone does not unite; new bone is formed round both pieces; the sequestra remain loose, and yet so wedged in, that it cannot be taken out, so that it becomes a tedious source of irritation, and after months of suffering, amputation is often at last had recourse to. I shall presently return to the consideration of this case.

There is a marked distinction, however, betwixt the case of fracture, such as I have just alluded to, and where the ball does not *perforate* the bone with unsubdued violence, but merely breaks it; and there is of course a great difference betwixt the ball perforating the arm bone, the thigh bone, or tibia, and when the bones of the fore-arm, or the

 fibula,

fibula, are broken. I have seen the arm amputated on account of the shattered state of the ulna; but this was quite wrong; for before and since I have seen worse cases do well, with only common care. Nor is the combination of a shattered radius and a torn radial artery a case for amputation.

It does not, in all cases of balls entering the heads of bones, follow that they pierce or lodge. I have specimens of all kinds of fractures by gun-shot; and amongst them of the head of the humerus shattered to pieces. In Haslar hospital there lay three men with the heads of the humerus shattered by balls; there lay many too struck about the shoulder joint. If a man be struck on the top of the shoulder, as represented in plate VII.; and if, upon laying the hand over the joint, and moving the arm, the bones are felt jarring; and if the bones are not merely fractured, but we discover by the finger in the shot-hole that they are crushed, it is considered very improperly a case for amputation at the shoulder joint. This is also a case which requires a distinct consideration.

When the ball enters into the lower head of the femur, and lodges, we may be long in suspence. By and bye the whole limb inflaming, and becoming greatly swelled, an abscess forms, perhaps, in the calf of the leg; we are then tempted to think that the ball has fallen down to that place, and that the abscesses being opened the ball will be found. But I have twice found this to be a great mistake; the ball has stuck in the bone; it forms a source of great irritation; that irritation

is

is not immediately shown by its effects on the bone, but on the surrounding soft part of the limb, and, as I have said, on the part of the limb below the seat of the ball. This swelling and great abscess in the leg, on dissection, shows that the cavity of the abscess is not formed in the cellular membrane; but the inflammation goes so high that the very texture of the muscle is destroyed. Besides this consequence of the injury to the bone, there is another effect to be taken into consideration, namely, the swelling of the knee-joint; although the capsule of the joint be not opened, yet the ball being socketted in the head of the femur, or tibia, the effusion into the joint will be converted into purulent matter; on dissection, after amputation from such a cause, I have discharged six ounces of pus from the knee-joint. The ball immersed in the lower head of the femur followed by these consequences of violent inflammation, and in an exhausted subject, gives occasion to amputation.

In plate VII., I have given a sketch of a man wounded in the shoulder; and, in plate IV. fig. 1. and 2., I have represented the shattered head of the humerus, which I dissected out after amputation. I have already described the appearance and the feel of the shoulder when that head of the bone is fractured by a musket ball in this manner. We have now to notice the effects: high inflammation, enormous swelling of the arm and shoulder, deep and extensive suppuration, large sinuses, dead bones discharging, and the patient dying

dying hectic. Such are the consequences; and these considerations presented to the surgeon's mind, he at once condemns the arm to be amputated at the shoulder joint, when he feels the bones crushed, and like a bag of sand under the deltoid muscle.

Such is the rule of practice in both army and navy, and I have seen the surgeons of both departments united in consultation, and in operation upon such subjects. Yet I am confident, this is not the right rule of practice: for, let us observe, that a ball through the deltoides is nothing. I have seen a man wounded by a ball passing betwixt the acromion scapulæ and the head of the humerus, where there was no necessity of doing any thing but giving him a bed to lie on. It is the fractured bone which creates the great inflammation, the suppuration, and sinuses. Now suppose, that instead of performing that very serious operation, the amputation at the shoulder joint, a decided and long incision be made through the deltoid muscle, the loose bones picked away, and the broken extremities of the humerus taken off with a small saw, what will the situation of the patient be? The operation is easy, not severe to the patient, and the cause of high inflammation and protracted suffering is removed. The arm is undoubtedly shortened, but it remains a useful member. When I see so many fine fellows mutilated by this too favourite operation at the shoulder joint, I feel that I cannot express myself too decidedly on this subject. This comes of want of

principles.

principles. The surgeon sees the terrible effects of gun-shot wounds, without contrasting sufficiently the case of a wound of a fleshy part with a wound of the bone, without therefore seeing that it is the bone that occasions all the mischief, without therefore thinking of removing the bone, and reducing the wound to a state comparatively simple.

I must next request my reader's attention to the figures 1, 2, and 3. of plate III. They represent the effects of a ball striking the middle of the humerus. When I saw the patient to which the bones fig. 1. belonged, I could introduce my finger into the shot-hole, which was exactly in the middle of the humerus. I have heard it thus stated, when the bone is fractured by the ball striking the bone, the arm is to be saved; but when the ball goes through the bone, and the finger introduced into the shot-hole, feels the broken pieces on all sides, and that the ball has passed through the cavity of the bone, it is a case for amputation. Let us examine the foundation of this opinion: —

The arm swells to a great size, the inflammation rises slowly, but arrives at a very high degree; abscess forms; and when the matter is discharged, and the tension relieved, deep spurious fistulæ succeed, and break out from time to time, preceded by an attack of fever, and with increase of suffering. The patient is harassed for a long time, and for years pieces of bone are discharged. If, after years, an opportunity is given of examining the bone, it resembles that represented, fig. 2.;

 a necrosis

a necrosis is formed, and the sequestra, fig. 3., has kept up the irritation for this great length of time.

Seeing this to be the state of the bone, and the bone the cause of the prolonged suffering, a question arises, whether there be any better mode of averting these consequences than by amputating the limb? In my opinion the practice is obviously this: make a deep and long incision down to the fractured bone, pick away the loose pieces; let those which are long and adhering to the membranes remain till thrown off by the suppuration; dress the wound with lint dipt in oil, so that the lips of the incision do not contract, nor the matter and slough be in the slightest degree retained; lay the limb on a wooden or tin splint, and apply wet cloths to the whole extremity. That the cure will be slow must be a necessary consequence, but the evils already enumerated will be avoided, and instead of years of suffering in the state represented, plates VIII. and IX., or the loss of the arm, the patient will preserve a useful member.

My reader will do me the justice to distinguish betwixt this decided practice in certain cases of fractured bones, and the scarification of gun-shot wounds in common cases. The Russian soldiers in the hospitals around Paris at the end of the war, were treated in the manner I have described, and their wounds, when compared with the state of the limbs of those who had been treated differently, proved in a very marked manner the superiority of the practice.

OF

OF LONG CONTINUED SINUOUS ULCER, AND OF NECROSIS FROM GUN-SHOT FRACTURE.

WHEN there is continual irritation from a number of loose pieces of bone in the very center of a limb (the consequence of a practice opposite to what I have recommended above), and when this endures for many months, nay, for years, we must expect disorders of the constitution to be the consequence, and a reflected influence from this upon the ulcers. We shall have occasion to remark how irregularities in living increases the irritation of the sores, and produce temporary increase of swelling in the limb. When the general swelling increases, leeches and cold cloths are applied to subdue the inflammatory tension. There follows, perhaps, a pricking pain in the bottom of the wound, and some small pieces of bone are felt: they are extracted, and give relief. Now it appears that these pieces of bone have been the cause of the deep pain, and general swelling, and the drying of the ulcers. But it is not always so. Often it happens that the inflammation has arisen from disorder of the system, from cold, debauch, or irregularity of any kind. Pieces of dead bone, which in the quieter state of the limb did not prick or irritate, when the system is thus disordered become a source of irritation.

The confinement and the depression of mind, especially in wounds of the lower extremities, will bring on a state of torpor in the venous system of

the intestines and liver, which must be relieved; after which warm stimulants to the stomach and intestines will show a favourable influence on the wounds, by a diminution of the irritability of the sores. When the limb swells, and the sores become of a dark fiery colour, the holes enlarge, (and this is a change which will take place from time to time,) we ought not to bleed in the arm, though we may apply leeches to the limb, if the state of the pulse admits it; always, however, remembering, that this is like an occasional exacerbation which will subside, and leave the patient exhausted and languid. It is therefore best to use such applications as will most effectually relieve the inflammatory action of the part, without lowering the strength of the system. Dip cloths in spirits, and apply them to the limb, not to the part only, but over the whole limb. By this the arterial action will be materially diminished, in a night's time the swelling will be so much lessened, that the skin will be corrugated, and the sloughing disposition checked. This means of subduing the arterial action will be found very effectual when there prevails that sloughy disposition in a gunshot wound, which endangers the coats of the neighbouring great vessels, and secondary hæmorrhage.

I have witnessed the effects of irregularities in officers who have had the long bones thus shattered and necrosis formed, but chiefly in the common soldiers sent up to Chelsea, have I noticed the consequence of this debauchery, when freed from

from the controul of discipline. In the men from whom I took the sketches, plates VIII. and IX., this was remarkable: in the first of these, several attacks had been sustained from which he had recovered; and in the latter, I have endeavoured to represent (which in an etching it is impossible to do truly) the effect of this sudden change of disposition in the wound. This young man had received a ball through the humerus, like that in plate VIII., and many others in the same detachment; the fracture had been improperly treated. Suppuration and discharge had taken place at A, and in succession at B, and again at C; after which the swelling and inflammation had so much subsided, and the wound being diminished to a weeping sore, he was sent off to be discharged. But when I saw him, the wound was beginning to open, the arm to inflame; he was hot and feverish, and sick, and the sore rapidly extended, and became foul and sloughy. It is such consequences from wounds of the bone that makes the army-surgeon so easily persuaded of the necessity of amputation; but which, I have already said, may be avoided by deep incision to the fractured bone, when the wound is first received. I have seen a wound of the os ilii, where the ball lodged betwixt the bone and the iliacus internus muscle, take this disposition upon it, and carry off the patient in a few days, after it was thought he was entirely out of danger.* When this disposition shows itself, I have

* I shall here transcribe my notes taken at the time, as expressive of my perplexity. " In the hole E I can feel the bone rough

have seen benefit, from emollient fomentation to the limb of decoction of poppy-heads, and applied tepid to the whole limb; after attention to the bowels, bark, with an aromatic, during the day, and James's powder, calomel, and opium in a pill at night.

OF NECROSIS FROM GUN-SHOT FRACTURE.

Is there nothing to be done for a patient who is suffering from an ulcer, out of which pieces of bone are successively discharged, twenty or thirty in the space of a year? As long as there is no

---

rough and spongy. I think I can distinguish the surface of the ball. The patient cries out when I endeavour to move this part. It is better to desist at present; the wound and constitution being so irritable. There is great mark of irritability in that flushed face." — "29. I know that I shall be mortified hereafter, if I find an irregular piece of lead sticking in the bone." — "30. This fine fellow must soon die, his face is still rosy, but he has pain in his chest, his breathing is affected, and his pulse weak and trembling." — "I think now that we should have attempted something more." — "The ball certainly has not entered into the pelvis." — "The ulcer spreads; the center sloughy and foul; the edges more irritable." — "It is painful to think, that by the extraction of the ball a source of irritation might be removed. — But would its extraction be attended with advantage? Certainly not now." — "If all this mischief is to be attributed to the presence of the ball; how was it that the wound was not larger than a shilling until he came here? Is it not the journey, the free living of a discharged soldier, or the bad air of the hospital that is the direct cause of this disturbance?" The preparation is in my collection, showing another example of the ball piercing the bone, but unable to go further into the soft parts.

great

great disturbance, I take up the case, and treat it as I would do a scrofulous affection of the bone, keeping the surface of the limb in activity by embrocation with warm oil and by fomentations, while the bowels are kept in action by a combination of laxatives and aromatics. The spongy ulcer may be washed with tincture of myrrh. Often the spongy fungous ulcer will heal over the dead bone, but the skin is not healthy, it remains thin and red, and tender, and is ready to break out again into ulcer. There is a rule of practice, which I would offer to my reader upon this subject, which is one I think he will not soon arrive at by experience. When a dead piece of bone is felt in the bottom of the sinus, and which cannot be brought away, the dresser stuffs the sinus, thinking that it ought to be kept open as the means of extracting the bone upon some future occasion. But the effect of this is a kind of inflammation in the bottom of the wound, which consolidates and binds the piece of bone more firmly. If, instead of this, the integuments are allowed to heal over the sinus, a soft abscess forms without irritation or much hardness, and the dead portion of bone is separated and lies in the abscess, and the more slowly the abscess makes its way outwardly, the more easily is the portion of bone disentangled.

Even in the case of necrosis, that is, where a new bone is formed round the old one (see fig. 1. pl. III.), and the latter is a perpetual source of irritation, we ought not to accelerate matters. There is a time when it will be proper to interfere to some decided purpose.

When many small pieces of bone have been discharged, when, after much pain and long suffering, the limb feels as if there was a bone in it of double or triple the common diameter; when at last a firmer and larger piece of bone is felt projecting, and when that piece of bone, though loose, cannot be extracted, the patient may be relieved, and a final cure obtained by the operation of trepan.

A long incision is to be made down to the bone, laying bare from three to four inches of it. The opening of the new bone, through which the sequestra or remnant of the old bone projects, is to be fairly exposed. The trepan, or trephine, is then to be set on the new bone, a little behind the opening, so that only a small portion shall remain betwixt the artificial opening and the original one. This being broken down by a strong knife, (which will be found quite sufficient to perforate the new bone,) room is afforded for elevating and withdrawing the sequestra, which we are to hope was already separated, and only retained by the smallness of the hole through which it projected. The limb must be covered with a wet cloth, and evaporation permitted to keep down the rising inflammation, for the operation is a very severe one, and may prove serious in a bad constitution.

OF WOUNDS OF THE JOINTS.

In plate X. fig. 2., I have given a sketch of a wound of the knee-joint: the ball struck the bone so obliquely, that it just opened the capsule, and went

went out through the integuments. Here is the very slightest possible gun-shot wound of the knee-joint, yet this man suffered amputation. When I dissected the limb, the knee-joint was full of pus; the quantity was so great, that it showed it had been confined. I cannot venture to say that amputation was improper in this case. But I must give my opinion, that the wound should have been dilated, and the purulent matter permitted to escape, before the necessity of amputation was declared; if, after this, the high inflammation should be succeeded by discharge, with the continuance of pain and fever, and night sweats, so that there is no hope of the constitution rallying, that, in short, the patient is sinking from hectic, which cannot be checked, then amputation must be had recourse to.

But I would not have my reader suppose, that because the knee-joint, merely opened by a ball, shall in one instance give occasion for amputation, that therefore, *à fortiore*, a ball through the knee-joint, or piercing the joint and sticking in it, must form a case for amputation. The treatment of gun-shot wounds of the great joints is a subject of much importance, and I would be happy to have recourse to authority; but our authors on this subject have left the question of amputation for gun-shot wounds of the joint in the same obscurity they have done the other important practical questions.

In fig. 1. pl. X. we see the ball has struck the inner condyle of the thigh-bone, in such a manner

as to open the capsule at the same time. This represents therefore a case of a ball entering and lodging in the knee-joint. Plate XI. fig. 1. A, represents the appearance when I dissected out the bone, the ball is seen sunk into the bone. This man's leg was amputated, and I think properly: I entreat my reader's attention to the special reasons. The influence of this wound, and the lodgement of the ball, had produced its full consequence unchecked by treatment. That prominence at A was a bag of matter: pus was in the knee-joint. The patient was exhausted by hectic fever. When the limb was amputated, and I had an opportunity of dissecting it, I found the knee-joint containing much green pus, and the whole muscles of the calf were as if bruised, and in the midst of the bloody mass of effusion there was a large irregular abscess. It is therefore certain, that this patient could not have recovered without amputation. But again observe, that this was a consequence of high action which ought to have been subdued; and, therefore, such a case does not decide the question of amputation in recent cases of gun-shot wounds of the knee-joint; it only proves to us what will be the consequence of omitting to subdue the inflammation.

I have given the sketch, plate XII., to confirm in my reader these facts. The ball entered into the head of the tibia. The forceps are represented introduced into the wound, where I and others thought we discovered the ball; but the ball had traversed the bone and lay on the other side, out

of

of reach of the instrument. The bone, with the ball, is represented in plate II. fig. 2. This patient was in every respect in the same state with the former; in the knee-joint there was much pus collected, and the muscles of the calf at A contained a bag of matter, surrounded by blood extravasated by the violence of the inflammatory action. This patient would have soon sunk under the effect of irritation and hectic fever.

Such narrations do not decide our practice in cases where a musket-ball has penetrated the knee-joint. Let me state the occurrence in another form: a gentleman is shot by a highwayman through the knee-joint. The patient is carried to the next inn, and the surgeon has an opportunity, not of subduing inflammation, but preventing it. The patient is bled largely and repeatedly, and the limb is covered with wet cloths, and kept in perfect rest. The probability is, that every thing goes on prosperously. But my reader is to expect threatening symptoms, and such as will make the patient, and the friends, suspect the propriety of this practice; inquietude and distress of mind, and convulsive shuddering of the frame, announce the injury to the constitutional powers, and that although you check the rising inflammation, you cannot protect the system from feeling the shock of the injury. Those will be subdued by opiates and aromatics, while the cold applications are to be managed, but persevered in.

When a ball enters, and is lost about the knee joint, the inflammation, if permitted, will rise

 very

very high, endangering life. When the influence of the wound has subsided, and the swelling has diminished, and the inflammation which extended all over the limb becomes diminished and limited, the presence of the ball is still a source of irritation, especially if the shot holes, or the sinuses are kept open. But even when they are permitted to close, the bone remains subject to inflammation, and on every attempt to move the joint there rises fever and inflammation. The patient's health is broken; he is pale and subject to a hectic flush. On examining the joint, we find effusions into the sheaths have consolidated all the parts, and we are apt to think that we feel the ball lodged. We are tempted to make incisions, but from this we must abstain until the suppuration leads us to the place of the ball, or until it can be distinguished from the thickened ligaments.

When a ball is lodged about the body or limbs, we are not to make incisions in search of it. The ball lies inoffensive: if deep seated, it does not excite inflammation; if superficial, it will work to the skin, and inflammation and abscess will betray its seat in good time. The rule is not so simple in its application in regard to balls lost about the knee-joint, but it is the same. We must not cut to search for the ball, nor use the trepan upon the bone, unless we are certain that without much disturbance to the joint it can be extracted. By the detail of the following case, the subject will be brought before my reader in all its difficulties.—

A foreign

A foreign nobleman leading his regiment to the attack of a French position at the battle of Borodino, having his right side to the enemy, received a ball in the most prominent part of the inner condyle of the left femur; it threw him down, and he was carried off the field. In the same day, he lost his elder brother, and his younger brother won high honors. The magnitude of the stake, the unexampled numbers engaged, account for this wound being only slightly dressed, and no attempt made to extract the ball, or to ascertain its exact position. By the dispositions of the armies which followed this great battle, and by the occupation of Moscow by the French, his soldiers were constrained to carry him from place to place during the period of the rising inflammation. The swelling and the inflammation of the thigh, knee, and leg, rose to an excessive heighth. The immediate consequences of which, were extensive abscesses in the thigh, from which they in vain expected the discharge of the ball. When the violence of this first inflammation subsided, and the abscess of the thigh closed, the surgeon kept open the original wound.—It was a considerable time after the attempts to discover the lodgement of the ball in the thigh, that in dressing the wound the probe was found to pass in a new direction, and being introduced to the extent of four inches, the ball was felt firmly fixed in the lower head of the femur. The object now was to extract the ball, and he suffered various attempts before he was sent to England. From

 Peters-

Petersburgh he followed the armies into France, and from Troyes, the whole Russian army being then on the advance upon Paris, he was, by the affectionate regard of the Emperor, conveyed to London.

When the General arrived in London, he suffered much from the effects of his journey, and his health was broken by the long irritation of the wound.

He had a countenance of much suffering, his pulse was irritable, and he was subject to frequent attacks of fever, ushered in by rigors, without being aware of their connection with the state of the wound.

The examination of the wound was made with gentleness, on account of the irritable state in which the General was; but even the introduction of the probe, and merely touching the ball, brought on an attack of fever; and by the advice of his Excellency Count Leiven, he was removed to lodgings in the country.

I ought to state here, that although I felt the honour done to me by this excellent man being put under my care, yet I construed the terms of it, and the expressions of interest in the General's situation, by his august Majesty, as a call upon me, not to proceed according to my unaided judgement, but to take the opinion of the profession of London.

My object was, by rest and quiet and a free air, to restore my patient's health, hoping that he would acquire constitutional strength, to permit

me

me to make a thorough examination of the wound.

In a few weeks his natural good spirits, and the strength of his constitution, restored him so far, that I was enabled to make an accurate examination of the situation of the ball.

The General stood, as I have said, with his right side to the enemy, looking backwards to the column which he commanded, when the ball struck the inner condyle of the left thigh-bone, exactly upon its utmost convexity. The probe being introduced at the wound, passed three inches and a half, when the rub of the ball is felt; the probe passed a little oblique downwards, traversing the substance of the inner condyle.

When I took into consideration the size of the bone, the depth and direction of the probe, and the circumstances of former cases, I was of opinion that the ball had been arrested by the root of the crucial ligament, where it is attached to the notch of the femur. The ball must have opened the joint, but it did not enter into it, and it remains very firmly impacted on the inside of the outer condyle, in the corner of the notch, and at the root of the crucial ligament.

Having ascertained the situation of the ball, I saw the great difficulty of the case. I called a second consultation; hoping that my friends would agree to my idea, which was to trepan the femur, and extract the ball. They saw much danger in the operation. A proposal was made to enlarge the wound of the skin, by touching the lips with lapis infernalis (kali purum).

The

The caustic was applied, the wound was a little enlarged, but there came on a very severe attack of erysipelas, which extended upwards to the groin, and downwards to the foot, with much fever. This very serious consequence of a slight touch of the caustic, proved more than any thing the deranged state of health; and, I confess, had its influence in finally inducing me to agree with the opinions of my brethren. Cold applications were used to the limb, bark in decoction was given, and antimonials at night. The General at this time suffered much, and his life was in danger.

Upon his recovery, I made various attempts to extract the ball, or to dislodge it, and bring it forward. I found this very difficult, from the depth of the ball, and the sensibility of the parts in which it was lodged, and I had an opportunity of observing the effect of the wound upon the constitutional powers; for whenever I disturbed the ball by considerable efforts, the fever rose twenty-four hours after, with tumefaction of the limb and erysipelatous blush. By such appearances I was long kept in check. My object was latterly directed to the fixing an instrument upon the ball, with which it might be drawn and solicited forward, so as to work its way through the bone. I was aware that a change must take place in the general constitution, before any violent and decided attempts were to be risked. By this repeated interference with the wound, I saw the General's constitution irritated, and I desisted.

Giving my patient rest, and continuing to attend to his general health, I waited until he was so far recovered, that the question of the propriety of a decided operation might be again discussed. I called into consultation the most eminent surgeons of London: we met; and the event of this consultation was unexpected to me, for tents were proposed.

Now the use of tents to dilate a hole three inches deep in a bone, I could not countenance, and my patient having suffered very much from such attempts in Switzerland, refused his consent to suffer a trial from which he had no expectation of success.

I, for the last time, called the attention of my friends seriously to my patient's situation. They were decided against the operation. The General himself now took alarm, at seeing so many were of opinion that his life would be in danger, and although his confidence in me made him say, he would suffer all in my hands, I did not think I was at liberty to urge the operation.

We now united in opinions that the wound should be permitted to close. My expectation from this was, that the ball would be inclosed in a consolidated mass, and that with the leg kept extended, and the parts by that means preserved from attrition against the ball, my patient would regain, in a very considerable degree, the use of the limb.—In this expectation I have not been disappointed.

I must

I must add, that if hereafter suppuration shall take place, then happily the matter will find a passage into the ham, and afford the surgeon an opportunity of extracting the ball without perforating the bone. I had the pleasure to see him before he left England, with the wound closed, the fever entirely gone, and the health, flesh, and colour returned.

I have seen the arm amputated for a ball through the wrist joint; but so I have for a ball through the small head of the ulna, and in both instances, the operation was altogether improper. The excess of fungus which is thrown out from such wounds, with shattered bones, betrayed the surgeon into a belief that the hand should be amputated. The patient will recover when a ball passes through the foot or ankle joint, or elbow or shoulder joint; such cases I have repeatedly seen. Unfavourable circumstances will sometimes bring these wounds into a state requiring amputation. I have seen a wound of the lower head of the fibula fall into a state which demanded amputation; but from such occurrences we do not draw the rule of practice, they form exceptions.

When there is a bad wound of the joint, with a wound of the great vessel, or nerves, a necessity of amputating the limb may arise from the complication. How the wound of the nerves shall influence our decision on the case, may not so readily occur to my reader's mind. I give the following example.

An

An officer consulted me as to the propriety of amputating his arm; the case was this: In storming a fort in the East Indies, they were driven back with great loss, many of the men being wounded, and many of them scorched by the blowing up of bags of gunpowder, which the besieged had laid in the breach, covered with straw. A native soldier made a push at my patient's breast with a spear, which he received in his left fore-arm; the point struck the head of the radius, and broke it. Soon after he received a ball in the elbow joint, not an inch from the first wound; the ball struck the olecranon, entered the joint, and the tendon of the brachialis internus stopped it, on the fore part of the joint. The arm inflamed very much, and successive abscesses were formed in the muscles of the fore-arm; the joint became immoveable; the arm wasted in an extraordinary degree; the arm and hand were without feeling, and the thumb and fingers were incapable of motion. Since the closing of the wound, the arm was covered with a scabby eruption. The arm stuck so awkwardly before him, it was so shrunk, stiff, powerless, and insensible, that I did not wonder that he wished it off, although he no longer suffered from pain.

The remark which this case naturally draws forth is, that when the nerves are thus cut to the certain loss of sense and motion, when we are certain that the use of the limb cannot be regained, we find no adequate reward for carrying our patient through the tedious cure; it is better to amputate in the first instance.

OF THE TIME FOR AMPUTATION IN CASES OF GUN-SHOT WOUNDS OF THE EXTREMITIES.

The French surgeons accuse us of delaying the operation of amputation too long, and by that losing our patients: they say that the French prisoners taken in our naval engagements, die in consequence of the operation being delayed until the ships get into port. I do not find that there is any foundation for this. The head of the naval department of the service knows as well as any man the necessity of early amputation, and the practice prevails also with the army-surgeons. But the curious circumstance is, that it is from the French that we are chiefly alarmed by the consequences of operating while the cold and benumbing influence of commotion is present in the limb, and the constitutional powers are suffering from the violence of the injury. They urge, (and, I confess, the arguments have had some influence upon my judgment,) that while the body is suffering under a violent injury, while the powers of life are suffering, a second violence, viz. the amputation of the limb, is too much, and the patient sinks under it.

This is a fact of very great importance to know, but it does not prevent the immediate amputation; and if the knife could follow the shot directly, it would be the more effectual in preventing the accession of those symptoms which have been described as consequent to the commotion of the limb. That large bolt or hook, which may be seen

seen among my specimens of fractured bones, was drawn out betwixt the bones of the leg of John Thomas of the Minotaur after the action of the Nile. It was buried in the leg, and when the seaman was brought to my friend, he thought it was a piece of detached bone elevating the skin. An incision was made upon it, and this piece of iron, weighing fifteen ounces, was drawn out from betwixt the tibia and fibula. It had entered behind, and stuck between the bones. — A few hours after the extraction, mortification took place upon the foot, showing itself in large vesicles of bloody water. Twelve hours after the action, the limb was amputated, but he never rallied, and died on the third day.

I require to take this piece of iron in my hand, and feel its weight, before I can form an idea of the shock the limb must have sustained by arresting this mass driven from the mouth of a cannon. It is not the part touched, but the whole limb sustains a shock; and in amputating, in such a case, the patient has not the usual sensation of acute pain; he bears the operation, as we would say, well, until by the observation of the countenance, by the hiccup and vomiting, you find that there is more physical insensibility to pain, than courageous sustaining of his suffering.

I have long considered the difficulties of this question, (once let me again say, neglected in our practical works upon the subject of gun-shot wounds,) and the facts lead me to this conclusion, that

that we are to delay an amputation until we see the spirits and animation somewhat returned; that we are to endeavour to rouse the powers of life by cordials, to sustain this second injury.—But the most attentive consideration of the circumstances do not, in my mind, authorize us to defer the operations of amputation to the second period; that is, until suppuration be established.

I shall now touch upon another question of importance, and commence my statement with a case given to me by a gentleman high in the medical department of the army.

Previous to the disembarkation of our army on the coast near the Helder, on the morning of the 17th August, 1799, the frigates and gun-brigs scoured the beach with shot and shells to cover the landing. A shot struck a Dutch rifleman, and carried away the left arm by the shoulder. The man was found lying on the sand hills, about a musket shot from the beach. In passing forward with the army, the state of this poor fellow attracted notice, The shoulder, that is to say, the head of the humerus, was completely blown away, and also a considerable portion of the scapula, and the half of the clavicle. The surface of the wound exhibited a horrid spectacle of ragged muscles and fragments of bones. The axillary artery was looked for in vain; and the case being considered desperate, nothing more was done than to cover the wound with some lint, so as to defend it from the drifting sand. The army pushed on after the enemy, and the poor creature was left where he

lay

day till the afternoon, when he was placed with the other wounded under a tent. The night was very cold; a good deal of blood oozed from the wound, but there was no gush or arterial stream. In the afternoon of next day, he was removed on a cart to a village two or three miles distant. My friend did not see him again till November, when he met him with other prisoners, who were returning from the hospital at the Helder, a convention and exchange of prisoners having taken place. The recovery of this man was to be attributed to circumstances in themselves distressing, cold and abstinence from food; for excepting a little cold tea, or cold water, he had nothing for the first forty-eight hours. It often happens that the wounded do well under such privations, who would have bled to death, or their wounds run into inflammation, so as to destroy them, had they been nursed amidst the comforts of private life.

It will now appear to my readers, that in the case of limbs torn off from the body by cannon-shot, we shall have nothing to do further than to seek and tie the great artery, and to put the flaps together, and keep the patient very cool and low. But something more may be required. In the battle of Corunna, Colonel M. had his arm shot off at the middle of humerus; the bone stuck out in shattered pieces, and the integuments were ragged and uneven. The surgeon, however, cut away the bones, and dressed the loose integuments. When I saw him, it was on the tenth day after the battle. He was reduced to the last stage of weak-

ness; sick, languid, and desponding. The arm was much inflamed, the stump was spungy and loose, and gaping with a profuse thin discharge, so that he had the prospect of protracted suffering; and this will be the consequence of neglecting to perform the operation of amputation, instead of being satisfied with cutting off the shattered bone.

Do not let the young surgeon suppose, that he has it always in his power in such cases, to perform the amputation with the double circular incision. It will, in general, be more convenient to form a flap, and that flap he must adapt to the form of the wound.

Οπισθοτονος.

Sketch of the oposthotonos from gun-shot fracture of the skull.

APPENDIX.

The following Observations contained in the former edition of this work have been omitted in their proper place, page 324.

DISTINCTIONS RELATIVE TO FRACTURED BONES.

THE several varieties of fractured bones may be noticed under the heads of 1. Simple fracture. 2. Oblique fracture. 3. Compound fracture. 4. Complicated fracture. 5. Comminuted fracture.

Simple transverse fracture is that in which the bone is broken directly across, or nearly so. It is the consequence of a force applied laterally to the bone; occasioned, for example, by a weight falling on the thigh; or by a fall in which the fore arm strikes against a stone; or by a stroke on the arm bone. There is in general, comparatively, little injury to the surrounding parts or shortening of the limb by the retraction of the muscles.

Oblique fracture is a consequence of force applied in the direct line of the shaft of the bone.

The points of the broken ends of the bone are longer and sharper, and are driven more into the flesh, than in the simple fracture; the fractuie is not directly across, but oblique, and sometimes the bone is riven up.

There is, in this fracture, a greater difficulty of setting the ends of the bone in due apposition, and in preserving the length of the limb, for the obliquity of the fracture allows the extremities to pass each other.

The Compound fracture is where the bone has not only been fractured, but has also been pushed through the skin. This circumstance, in a remarkable manner, changes the nature of the case, and the danger is much greater.

There

There are some varieties which it might be allowable to class under the head of Complicated Fracture, where the difficulties of the case are increased, and the cure becomes more precarious and tedious. One is where the bone is not merely broken across, but shattered or broken in more than one place. Another is a fracture by gun-shot, which has several essential circumstances quite peculiar. Another complicated case is, where the broken bone has been forced against an artery, and the fracture is complicated with aneurism, or there may be both fracture and dislocation, as frequently happens in the ancle joint. A fracture, where the fissure of the bone is continued into the neighbouring joint, must also be classed under this head. In fracture of the spine too there is more danger from the injury to the spinal marrow, than from the fracture of the bone; and in fracture of the rib, with injury of the lungs, the importance of the case rests chiefly on the latter circumstance. The danger and all the circumstances of the cases now enumerated being peculiar, they may be ranked under the class of complicated fracture.

Fractures of the skull form a subject quite distinct, on account of the peculiarity of symptoms, and the treatment to be followed, the whole case coming under the influence of a very different principle from that which regulates the practice in cases of the fracture of other bones.

The last distinction is that of the Comminuted fracture, that is when the bone is bruised

 and

and broken into small pieces. Thus I have felt a bone struck by a bullet like a bag of sand, and when a heavy body has crushed the bone, although the skin be whole, the feeling of the fractured bone assures us that there is more danger in the case than meets the eye.

When, in consequence of a fall, the limb is distorted, and evidently fractured, the greatest precaution should be used in replacing it in its natural position, and the patient ought not to be moved from the place until such temporary support be given to the limb, that he may be carried without pain or farther injury from the motion and twisting of the shattered ends of the bones.

If the accident be recent, and the swelling coming on, the surgeon ought not to lose the favourble opportunity for examining the position of the bones and the joints. When the swelling and inflammation have arisen, such examination will often be found impracticable.

The bone is ascertained to be fractured by the unnatural position of the limb, the hand or foot being generally twisted, having fallen down; or by the harsh grating feeling communicated to the finger, when placed on the injured part, during the movement of the limb. In feeling the part, we continue to trace some projecting spine (as of the tibia or ulna), the better to ascertain the displacement of the bones. But this being insufficient fully to inform us of the nature of the accident, we must take the whole limb in our hands, or make a careful assistant do this while we have our

our hands surrounding the injured part, or, should it be an injury of the chest, we place the hand broad on the side, while the patient breathes.

In performing this necessary office, I need not say that the bone is insensible in its natural state, and before inflammation has arisen, and that the pain occasioned by the accident is owing to the injury of the soft parts: the pain of the operation is merely that of the repeated injury of the surrounding parts by the ends of the bones; so that every unnecessary motion is to be guarded against. But it is of more importance to say that, in the first examination of a limb, we ought to be fully satisfied, so as to leave no doubt of the nature of the accident; for if we cannot ascertain the nature and extent of the injury at first, we shall be less able to do so when the swelling and inflammation have advanced; and when that swelling and pain have subsided, we may have lost an opportunity not to be regained.

Where great arteries or nerves run close upon the fracture, (as in fracture of the thigh bone a little below its middle,) we must be particularly careful how we move the bone; for by incautiously twisting it, or by the rough carriage of the limb, the artery may be torn upon the sharp ends of the bone.

It may in general be said that, in distinguishing fracture from dislocation, there is in fracture less distortion, and less rigidity of the muscles and tendons, with greater pliancy in the limbs; and that though there is pain, there is yet free

motion when the surgeon moves the limb; while in dislocation there is a checked and interrupted motion.

The mere fracture of the bone would in no instance require attention to the system, or any general treatment; but the bruising and laceration of the soft parts which accompany the breaking of the bone may, by producing and propagating an action distinct from that which would knit the bones, prevent the formation of the callus or new bone. Either the high and inflammatory state of the general system, or an inflammation tending to suppuration of the part injured, will retard the cure; and therefore all that is necessary, all that we can do, is to relieve the system from its high action, soothe the local inflammation, and, as it were, procure time and opportunity for the ends of the bones to take upon them the change necessary for the formation of the callus.

When, therefore, we have reduced and adapted the broken bones to each other, (the manner of doing which I am presently to describe), we have to consider the nature and extent of the general or local injury, and comparing it with the circumstances and constitution of the patient to proceed accordingly. If a person in the full vigour of health be thus suddenly confined to a posture, with a rising pulse and considerable pain, bleeding is indispensable. When there is much swelling in the injured limb, it should be placed in a natural and easy position, but not bandaged; on the contrary, we bleed with leeches, and by fomentation promote the

the bleeding and allay the swelling. If, from the violence of the injury, and the shock, and the alarm of the patient, fever and delirium succeed, or restlessness with shaking and spasm of the limb, the fracture should be covered with compresses and soft slight bandage, and pillows rather than splints should be applied around the limb. We must wait for returning composure, and the subsiding of the swelling, before we finally adjust the limb.

In this state we must by no means give opiates with the intention of quieting the perturbations before very free evacuations have been made.

If we find restlessness and irritation prolonging the pain and retarding the cure, it most probably proceeds from a neglect of the bowels. By procuring regular motions and by an attention to diet, this irritable state will subside. By stillness and want of exercise in a habit perhaps naturally active, accumulation in the bowels is particularly apt to happen, which produces a feverish state. During the confinement, free air and a change of the bed-chamber, if it can be accomplished, and recreation, is very necessary.

By the same force which broke the bone, but oftener by the contraction of the muscles, the broken ends of the bone are generally pushed past each other. Our first object is, by extension of the limb to place the extremities of the bone in their natural relation to each other; next we have to take care that the part of the limb which is below the fracture be made to lie in its natural position, that it is not twisted, and not suffered by gravitation

or

or any other cause, to decline from its proper direction. Thus, if we do not take precautions against it, when the fore arm is fractured, the palm will fall prone and distort the bones: the foot will naturally, by gravitation, fall outward, and lie upon its outward edge, when the thigh bone or the tibia is broken; and when the bones of the leg are broken, the lower portion will be drawn backwards.

When the limb is put into what we conceive to be the natural position, we have to observe whether it spontaneously retracts, which it is apt to do if the fracture be oblique. This we must endeavour to counteract.

If we can procure it at the time, we should apply a pledget of soap plaster, which is especially to be put on the part of the limb where the splints are expected to chafe; after this the bandage is applied. Along the limb, and in those parts where there are hollows, or a flatness which will not be uniformly embraced by the splints, we lay some layers of lint or old linen soaked in brandy, or a solution of crude sal ammoniac in vinegar and water. When we wish to give unity and firmness to these applications, we soak them in gum, or in the white of an egg. When stiff unyielding splints are to be used, much of the security and ease of the limb depends upon laying this groundwork. By the placing of these aright, all pressure of the bandage or splints, may be prevented on the sharp spines, or on the fractured extremities of the bones, and, where the

 bones

bones are only thinly covered by integuments, or where the skin is tender, it is of much consequence that they be protected.

Further, by the management of these pieces of linen, and these compresses, the necessity of a bandage under the splints may be avoided, if the circumstances of the case indicate the necessity of frequent examination; for by this means, the splints coming to press equally over the whole limb, (unless on the guarded parts,) the limb will be sufficiently supported by the bandage which is placed above the splints.

The bandaging of a fractured limb before the splints are applied, is certainly of use; but there is always danger of the roller being applied too tight at first, or becoming so from the swelling of the parts. In that case it is not merely the undoing of a superficial roller which is required to give ease, but the limb must be raised from its place and the fracture disturbed. The splints are to be taken off, before the bandage can be undone. However, if only a slighter relaxation of the roller be required, it is possible to cut the turns of it so that they may be put down again, like the eighteen tailed bandage.

The splints are to be had in the shops, and every young man can make them. But I would recommend pasteboard to be much used, especially in the lesser splints which may be required, while one larger, of wood, or leather and wood, gives strength to the whole. The only disadvantage of the pasteboard, is, that in the event of rising inflammation

flammation and tumefaction, we may wish to apply wet and cool cloths to the part, by which the splints are softened; but still if the larger splint be firm, it will be a sufficient guard. When there is an evident necessity, in the beginning, for fomenting the limb, it ought to be laid out on the tin splint.

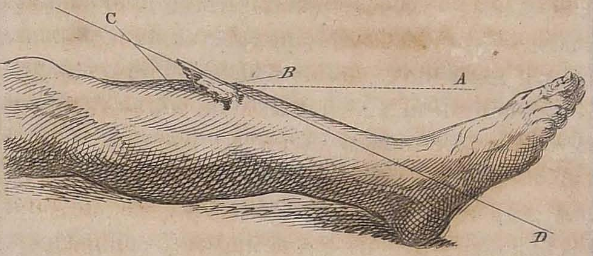
When we bandage a limb, for whatever cause, we must support the lower part of it by a few turns of the roller; else a fullness and kind of strangulation, as it were, will take place in the hand or foot.

In regard to the position in which the broken member is to be laid, we may say in general that the joint is to be relaxed, or the limb placed in a half-bent position; there are exceptions to this rule, but we shall reserve this part of the subject until we come to speak of the particular accidents.

In laying a limb with a COMPOUND FRACTURE while the principle which governs us is the same, some things must be differently managed from that of a simple fracture.

We have already remarked that there is a real and important distinction in the simple and compound fracture, arising from the mere breaking of the skin, or the external wound. Our first care then is, if possible, to reduce the accident to the nature of a simple fracture, by securing the healing of the external wound. But perhaps the bones project and cannot easily be withdrawn from the wound.

This



This plan will shew that when the end of the broken bone projects, the direct extension of the limb is improper, it forces the sides of the bones against each other, and the upper broken portion of the bone into the flesh.— If we were to pull this leg in the direction A, then B would be forced against C, and the sharp point C forced into the flesh, and the wounded integuments would be girt round the ends of the bones. We must therefore extend the lower part of the leg in the axis of the lower end of the bone, in the direction B, D, until the two ends of the bone are no longer thus locked into each other; then raising the foot into the position A, the parts are adapted to each other.

If they project through the skin a long splinter of the bone, which we foresee cannot well be retracted, or without injury to the surrounding soft parts, then it had better be taken off with the saw.—To saw or break off the projecting point of bone is better than to cut up the integuments.

If

If there appear loose pieces of bone in the wound, we must introduce the finger, or if that be not possible, we must enlarge the wound so as to enable us to do it. Having ascertained that there are pieces of bone broken off, (though we know that such insulated pieces may unite,*) it is better to take them away; for it is probable that they will not preserve their life, and re-unite to the bone, in which case they give great trouble, and prolong the patient's sufferings, keeping up a profuse discharge. In using the scalpel to take these loose pieces of bone away, we must keep the point of the knife close to the surface of the bone; by cutting wide of that direction, an artery may be opened, and the case made very complicated.

In less formidable cases of compound fracture, when the bones are replaced, our next object ought to be so to adapt and bring together the integuments, that they may unite by the first intention. They ought to be brought together by a slip of plaster, if they admit of it, and over this a piece of dry lint should be laid on lightly, so as to absorb the first exudation; this may be covered by a piece of cerate; but nothing oily should touch the wound, where we hope for the scabbing and healing of the broken skin.

In other respects the limb is to be managed as a simple fracture, only that in this case we certainly cannot use a roller, but only the eighteen tailed

* See a specimen of injected bone in my collection.

bandage;

bandage; and in applying it by leaving such tails, as cover the wound, hanging out untied, till the rest are bound up, they can at any time be unpinned and taken off, to expose the wound for the convenience of dressing, without moving the rest of the bandage, or disturbing the limb.

But a compound fracture in the common application of the term, may be a bruised and lacerated limb, complicated with fracture of the bone; not the effect for example of a shock in falling, which breaks the bone and pushes it through the skin; but of the injury received by a waggon wheel going over the limb, bruising and cutting and laying open the shattered bone. Here, of course, the reduction and position of the bone is our least care. The inflammation in a good constitution must rise to a great height; in a bad constitution the natural high action (a necessary consequence of a previous healthy state of the body in these circumstances) may be converted into bad inflammation, and have a tendency to gangrene*. We have to study the previous state, and watch the present symptoms; relieve the high activity by bleeding, and by every relaxing means lower the irritation, correct the habit; and as to the limb, to lay it easy is our only aim, until the high tumefaction and pain shall have subsided; then suppuration will have taken place.

* In practice it is of the utmost consequence to ascertain the state of the soft parts—a fracture with contusion, though we must call it a simple fracture, is often wôrse than a compound fracture.

Good suppuration ensures the subsiding of the inflammatory tumour, and of the high tension and irritability. But if after a time, the discharge continues and becomes profuse, there is either a cause of irritation in the wound which may be removed, or the constitutional powers have been allowed to go too low. By probing gently, perhaps, a loose piece of bone may be removed, with an immediate change in the complexion of the wound; or on examination of the parts we may discover a lodgment or sinus, which were better opened.

When the pulse indicates rather the quickness and irritability of languor or exhaustion, than of inflammatory fever, by changing the plan of diet, and general remedies, and by supporting the system, we may restore due energy to the bodily powers.

When the languor increases, and the appetite fails, when the perspiration is copious and easily excited, and a purging threatens to reduce the patient to a still greater degree of weakness; then bark and wine, and nourishing diet, and free air, if possible, are our resources. After this, the patient still sinking, and the integuments losing their tumefaction, and becoming loose and flabby; and from the unfavourable state of the bowels, the food having ceased to be nutritious, while wine and brandy give but a temporary excitement, without returning vigour, the question of amputation comes to be discussed. If the powers of the constitution be not entirely exhausted, so that there is still vigour to produce the necessary tumefaction,

and adhesion of the flaps on the stump, amputation will be safe.

There is one point of doctrine on which I believe it necessary to say a few words in these introductory remarks. It regards the nature of callus, and the question concerning the extent of motion which may be allowed to a fractured limb.

If this book possess any merit in proceeding directly to that point, the consideration of which most embarrasses the surgeon, it results from my having observed the difficulties which my pupils experience in fully comprehending their teachers, and from attending to their remarks and their reasoning. It was only a few days ago that I heard a very ingenious young man say, that the fractured thigh bone should not be set until the end of the third week; and he supported his opinion by the practice of an hospital surgeon of some reputation. A short expression of my conviction of the folly of this dogma would not carry the same weight with it here as I hope it did with my pupil. I shall therefore insist upon it more at length, and discuss also the question of the degree of motion to be allowed to a limb in fracture.

I have before me the short notes of three dissections, which, if I mistake not, afford me full ground upon which to reason securely.

1. The first describes the state of the parts immediately after the fracture. The bones have suffered a complicated fracture, being much shattered; they hang together by the surrounding cellular membrane

membrane, and the periosteum—they are surrounded with coagulated blood.

2. The second refers to a fracture of the thigh bone, if I recollect, three weeks after the fracture occurred. "The bone has been broken across in two places, leaving an intermediate portion. The intermediate portion is immersed in a substance, which to the eye is like jelly, but which has a considerable degree of toughness. It appears as if the periosteum were continued from the circumference of the bone; yet this cannot be. There is here a new-formed membrane, which in time would have been the periosteum of the new-formed bone. This periosteum is remarkably strong and thick, and the callus to a considerable depth is also tough. In this mass I discover with my hook or probe many distinct particles of bone."

3. In a preparation of a fractured bone, which had been firmly knit together, and which after being injected had been made in a degree transparent, I observe the old bone white and little porous, but the new-formed bone which unites the old portions is more vascular, and deprived in a greater proportion by the acid of its phosphate of lime.

From these facts, without entering upon a physiological view of the subject, I shall endeavour to draw the practical lesson.

When the injury is first committed, the cellular membrane around the broken bone is torn; the lesser vessels are opened; and the blood is effused. At this time any slight motion of the bone does no harm

harm unless it tears up new parts. Presently the blood is absorbed; the injured parts throw out a more regular secretion; the membranes form new adhesions to the bones; a tough membraneous substance unites them, and in the apparently confused mass, which surrounds the extremities of the bones, small irregular points of bone are formed. Is not this sufficient to give conviction that if the limb be rudely moved after the new adhesions are formed, these adhesions must be again torn up? and if these particles of bone be formed, must not the motion of the limb cause them to cut and tear the vessels and membranes by which they are surrounded? so that at last, if this motion be allowed to any extent, the disposition to the formation of bone is destroyed, and the process baffled as it were, in its design, stops short of the true effect, and the bones are united not by bone but by a tough ligamentous substance, and the extremities of the broken bone are rounded off, so that an artificial joint is formed. It is surely no erroneous conclusion to draw, that motion, to a certain extent, will destroy the disposition in the action to unite the bones by bone; and that in a lesser degree it retards the cure, and makes the confinement longer, increasing the chances of failure. On the other hand, no argument will ever be discovered against giving absolute rest to the limb.

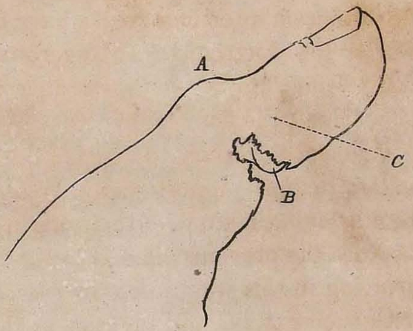
But we must not be so blinded as to carry the argument too far. If, on examining a limb, we find that it is distorted or retracted, we place it again in its proper position, and endeavour more

 per-

perfectly to secure it, because by this twisting or extension we do not, as by a perpetual teasing interference with the process going forward, destroy the usual disposition. Here the new adhesions may be broken, and they will readily unite again, and the cure go on.

To say, however, that because we can thus interfere with a broken limb, without essentially interrupting the cure, that it is time enough to set the limb in its position after four weeks have elapsed, were to carry the doctrine to a dangerous and ridiculous extreme; for at such a distance of time from the accident, the connexions must be strong, and the violence necessary to replace the limb in its natural situation proportionally great. It is but at best bringing matters to their original state, and of course the previous time is lost; the confinement being in this way much increased. We can ascribe such extravagant practice as this, only on the one hand to ingenious argument pushed rather too far for common readers, and on the other to stupidity in taking the illustration of a doctrine for the enunciation of a principle. A fractured bone will feel quite loose towards the end of the third week, and in three or four days more it will be firm. This, I suppose, is the origin of the opinion, but the fact is insufficient to establish the rule of practice.

SINCE writing the observations on the dislocation of the thumb, I have reduced a dislocation of the last joint; it was a compound dislocation; the last bone was forced through the skin. It could not be reduced by pulling. When I bent it backwards it gave great pain, but when I bent it towards the palm it went into its place, without the patient being aware that I was making the effort to reduce it.



A the end of the second bone of the thumb, B the head of the last bone of the thumb appearing at the wound; when the thumb was brought to the line C, the bone B rose and slipt into its place.

EXPLANATION OF THE PLATES

OF

GUN-SHOT WOUNDS.

Plate I.

IN this figure two wounds are represented, which however were inflicted on different men. These were taken as examples of the difference in the state of the slough of the two orifices. In the wound of the integuments of the belly. A marks where the ball entered. B where it made its exit. In the wound of the testicle, C marks the orifice where the ball entered. See page 449.

Plate II.

Fig. 1. The lower end of the femur. A the ball sunk into the outer condyle, the bone is slightly fractured, the ball retains its figure.

Fig. 2. The head of the tibia pierced with a ball. A the hole by which the ball entered. B the ball where it has made a passage through the bone, but has been detained by the ligamentous connection. See what is delivered on this subject, page 451. These are examples of balls penetrating the cancelli of the extremities of bones.

Plate III.

Fig. 1. In a gun-shot fracture of the humerus. We see here a remarkable contrast in the effect of the ball striking the body of one of the long bones. This and the two following

lowing figures lead to a very important discussion, upon the propriety of amputation; in such cases see page 471.

Fig. 2. Necrosis of the humerus, the effect of gun-shot fracture.

Fig. 3. The sequestra or old bone drawn out.

Fig. 4. Two of the dorsal vertebræ. A ball is seen to have pierced the body of the vertebra, and to have been stopt by the ligament or fascia longitudinalis.

Plate IV.

Fig. 1. The humerus fractured by gun-shot.

Fig. 2. The head of the same bone. We see that the ball has shattered the bone into twenty pieces, and riven the shaft. See Plate VII. and page 473.

Fig. 3. The clavicle and scapula.—The clavicle was broken by the ball, which then passed into the chest, and broke the ribs behind and stuck in the scapula. But here also the ball had penetrated the bone, and was resisted by the ligamentous connections. See further, Plate XIII.

Plate V.

This plate represents a man wounded through the chest. The ball entered from behind and came out by the wound here represented. This was evident from the beginning, by the discharge of frothy blood from the mouth; but although he was in great danger, he is now recovering. This case stands in contrast with the next, and with that of the officer, Plate XIII.

Plate VI.

This man received a ball in the same part of the back with the last-mentioned patient. He seemed in great distress; his breathing was affected; his account of his feelings on receiving the wound was very confused; and it was supposed that the ball had entered the chest. By and bye, a blush of redness was perceptible on the fore part of the

chest;

chest; an abscess formed here, indicating the place of the ball. The abscess being opened, the ball was actually found; but the probe, in place of entering the chest, was found to take a course over the shoulder. So that it was proved to be a *superficial wound.* The ball had struck the rib, glided upwards, and turning over the shoulder, still coursing under the integuments, it lodged at last at the point opposite to where it entered.

Plate VII.

This man received a musket ball in the shoulder; the ball entered by this wound, and came through behind, shattering the head of the humerus in its passage. The head of the bone is represented, Plate IV. fig. 1. and 2. This man's arm was amputated at the shoulder joint, and he did well. I entered fully into the merits of the case, admired the decision and the dexterity of the surgeon, and thought it one of the points of military surgery determined—that in such circumstances we should amputate. A calm consideration of this and other cases, has convinced me that this ought not to be the rule of practice. See further, page 473.

Plate VIII.

This sketch was intended to represent that state of fistulous ulceration which attends such a fracture of the humerus as we have in Plate III. fig. 1 and 2. when the arm is preserved. He was a very stout and intrepid looking fellow. He was charging with the bayonet when his musket was knocked out of his hand as he thought; but he found that the ball had struck the arm, and that the bone was broken. We may perceive two holes in the arm; these are not the wounds made by the ball, they had long since healed, but these are the sort of ulcers which open from time to time, discharging small pieces of bone, and all that darker part which is around the holes marks the extent of new skin from an extensive ulceration which had recently

recently healed at the time this drawing was taken. There is a small painting in the museum which gives a better representation of the ulcer which attends the necrosis of the humerus from gun-shot fracture. It occurred in a patient after I had made this etching.

Plate IX.

This sketch also represents the effect of gun-shot fracture of the humerus.

This boy had suffered a great deal by swelling of his arm, abscess, ulceration, and the discharge of many small pieces of bone. Three marks are distinguishable upon his arm, A, B, C. The scars of former ulcerations which came in succession after fever, great swelling, abscess, and bursting out of matter. The swelling had subsided, the ulcers were dry, no bones had been discharged for some time, when unexpectedly, soon after he was sent to town, he was seized with fever; the swelling recommenced with great pain; the ulcer opened into a large efflorescence, and that irregular part here represented (D.) is a large fungous irritable sore.

This is an example of cases which has led me to some important disquisition, see page 475.; all this suffering comes of an improper method of treating gun-shot fractures of the long bones.

Plate X.

Fig. 1. Represents the swoln state of the leg with suppurations among the muscles of the leg in consequence of the ball sticking in the head of the thigh bone; the bone is represented Plate II. fig. 1.

Fig. 2. Represents the capsule of the knee opened by a ball, the knee in consequence full of pus.

Plate XI.

Plate XI.

I took this sketch to exhibit the effects of a ball lodging in a long bone. We see how the whole limb is swollen; and so it will be until extensive suppurations destroy the substance of the limb, unless the inflammation is prevented rising. The limb was amputated, and the bone is represented, Plate II. fig. 2. Here the forceps were introduced to extract the ball; but it was not the ball which was felt. A represents the bag of a great abscess, which formed among the muscles: the knee joint was full of pus.

Plate XII.

Fig. 1. Represents a gun-shot wound, where the head of the ulna was struck. The arm was amputated: it might have been saved.

Fig. 2. The representation of the wound mentioned page 455. The ball entered at A, came out at B, entered again at C, and was cut out at D.

Plate XIII.

Sketch of the body of ——. The ball broke the clavicle of the first rib, passed into the chest and through the lungs, broke the fifth rib, and stuck in the scapula. See Plate IV. fig. 3.

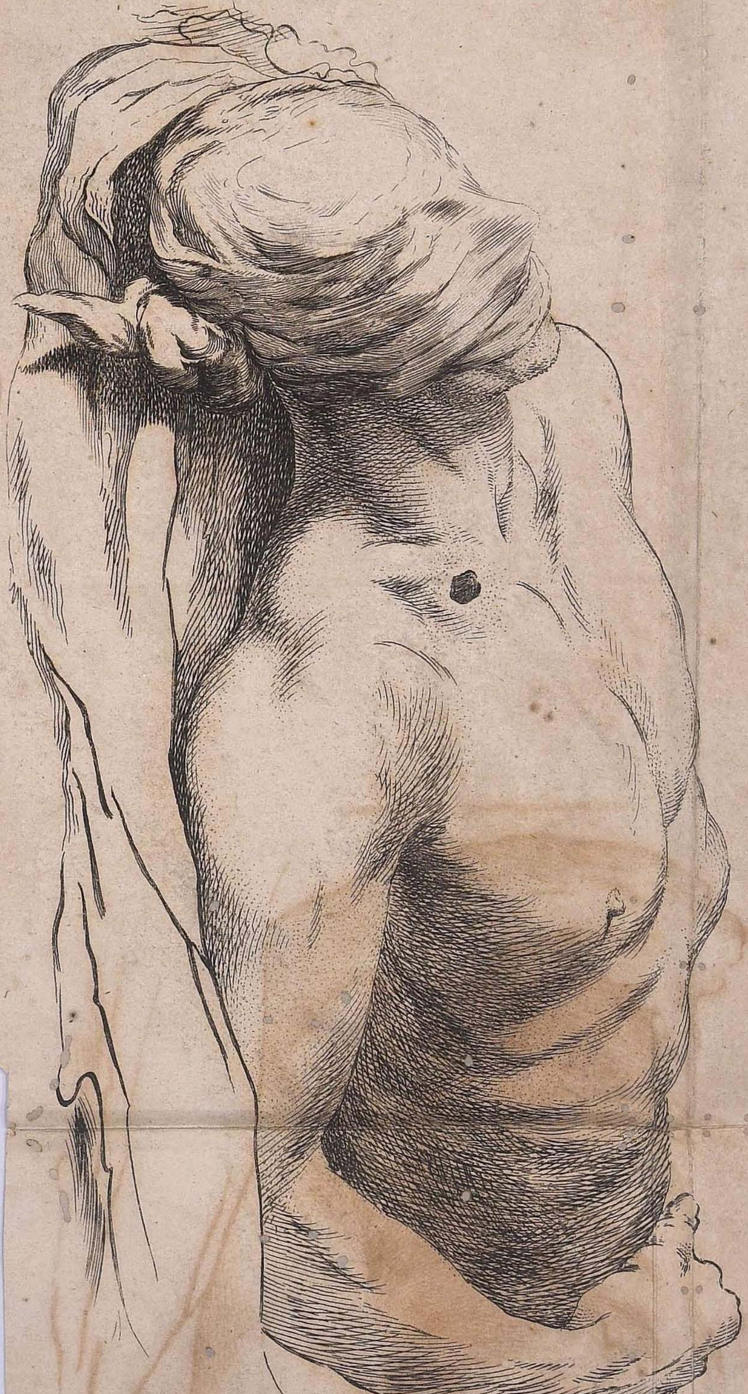
This gentleman survived the first danger of suffocation from blood escaping into the cells of the lungs, and into the trachea. He also bore the first rising of the inflammation; but died on the twelfth day, from the extent of serous effusion in the thorax. When I made the incision into the chest, the fluid spouted out, and continued to flow as from a cask. All the upper part of the lungs of the left side, were of a liver-like firmness, from extravasation and inflammation.

THE END.

Strahan and Preston,
Printers-Street, London.

Plate XIII.

2089



Published Oct. 1. 1814 by Longman, Hurst, Rees, Orme & Brown

Plate XI.

Published Oct. 1. 1814 by Longman Hurst Rees Orme & Brown

Plate XII.

Fig. 1.

Fig. 2.

Published Oct. 1. 1814 by Longman Hurst Rees Orme & Brown

Plate IX

Published Oct. 1. 1814 by Longman Hurst Rees Orme & Brown

Plate X

Fig. 1

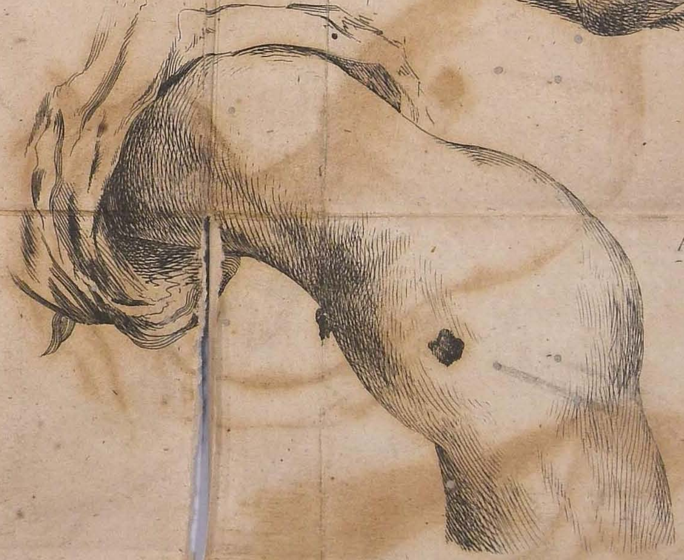
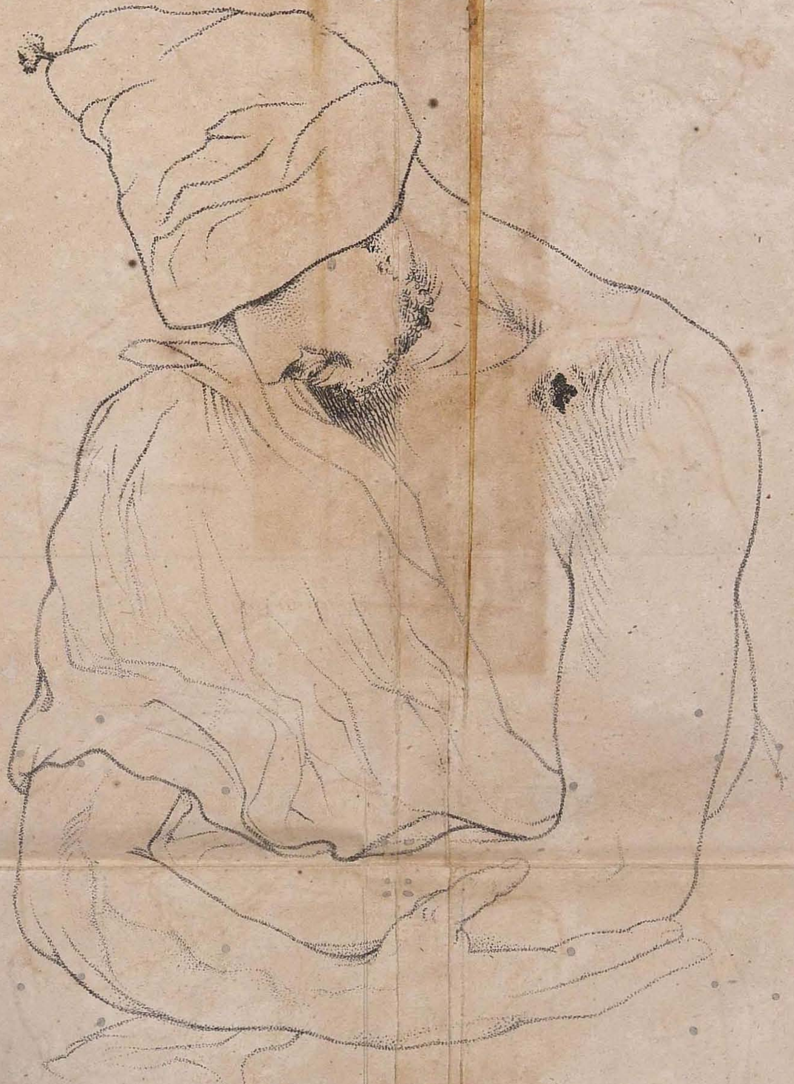


Fig. 2

Plate VII.

4



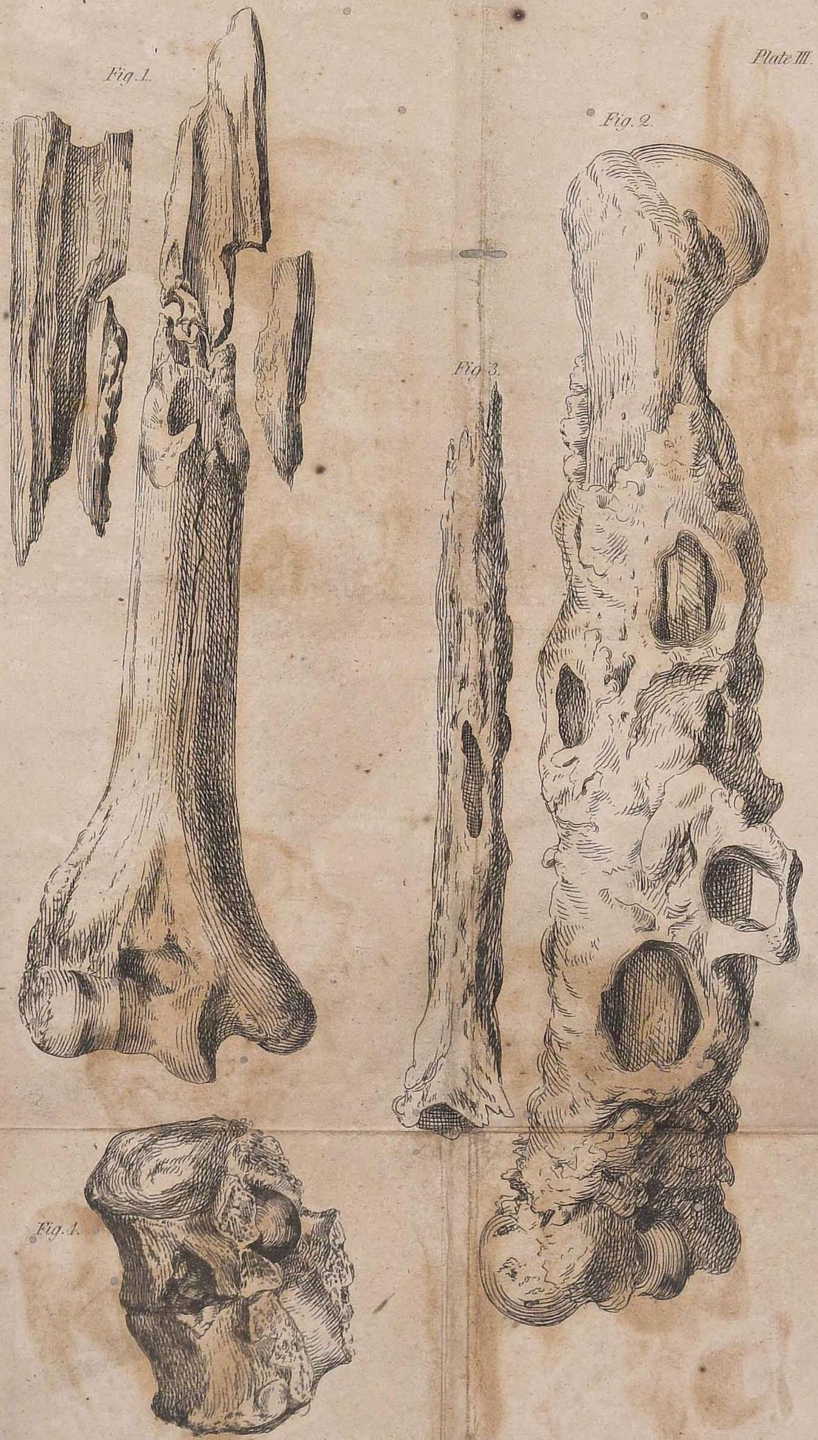
Published Oct. 1. 1814 by Longman Hurst Rees Orme & Brown

Published Oct. 1. 1814 by Longman Hurst Rees Orme & Brown

Published Oct. 1.1814 by Longman Hurst Rees Orme & Brown

Published Oct. 1.1814 by Longman Hurst Rees Orme & Brown

Plate III.

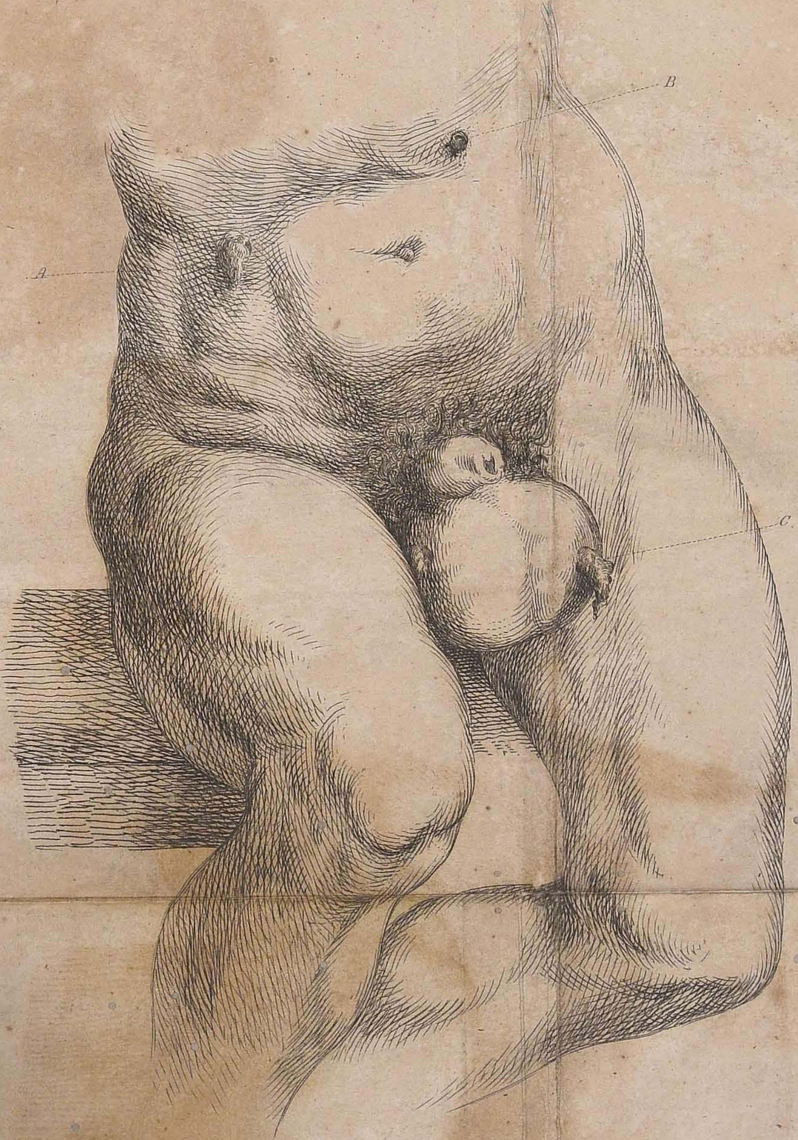


Published Oct. 1. 1814 by Longman Hurst Rees Orme & Brown.

Plate IV.

Published Oct. 1. 1814 by Longman Hurst Rees Orme & Brown.

Plate I.

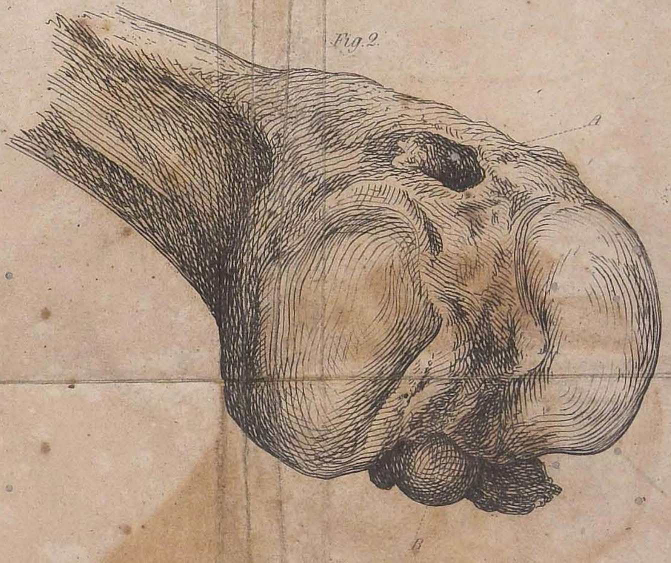


Published, Oct. 1. 1814 by Longman, Hurst, Rees, Orme & Brown.

Plate II.

Fig. 1.

Fig. 2.



Published Oct. 1. 1814 by Longman, Hurst, Rees Orme & Brown.